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Articles dealing with any phase of botany relating to the Great Lakes Region may be sent to the Editor. In preparing manuscripts, authors are requested to follow our style and the suggestions in "Information for Authors" (Vol. 28, p. 43; Vol. 29, p. 143).

THE MICHIGAN BOTANICAL CLUB

Membership in the Michigan Botanical Club is open to anyone interested in its aims: conservation of all native plants; education of the public to appreciate and preserve plant life; sponsorship of research and publication on the plant life of the State; sponsorship of legislation to promote the preservation of Michigan native flora; establishment of suitable sanctuaries and natural areas; and cooperation in programs concerned with the wise use and conservation of all natural resources and scenic features.

Dues are modest, but vary slightly among the chapters and with different classes of membership. Persons desiring to become state members (not affiliated with a local chapter, for which contact persons are listed below), may send $17.00 dues to the Membership Chairperson listed below. In all cases, dues include a subscription to *THE MICHIGAN BOTANIST*. (Institutions desiring to subscribe should deal directly with the Business and Circulation Manager.) Foreign subscribers should remit in U.S. funds.

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THE CHAMPION TREES AND SHRUBS OF MICHIGAN

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The Big Tree Program of the Michigan Botanical Club started soon after the organization of the club in 1941. Paul Thompson, affiliated with the Cranbrook Institute of Science, became the state's Big Tree Coordinator and served in that capacity for over forty years until his death in 1994. Many individuals, mostly Michigan Botanical Club members, worked with Paul over the years as he set about discovering, measuring, and recording Michigan's biggest trees and shrubs. Champion-size trees were reported to *American Forests*, nominated for National Champion status, and subsequently listed in the "National Register of Big Trees" issued every two years by *American Forests*.

I began my work with Paul Thompson in 1991. We had decided to prepare a series of short articles for publication in *The Michigan Botanist*. Paul described trees he thought I could find, gave me careful directions to their locations, and I began a new set of measurements. About two dozen trees had been located and re-measured before his death in 1994. The series of articles in *The Michigan Botanist* has continued to grow. As of February 15, 1998, 15 have been published, another 11 have been submitted, and four more are in preparation. These articles are described in the next section of this paper and listed in Table 1.

Paul Thompson had an amazing ability to recall instantly a great many details about each champion tree or shrub and its location. He enjoyed telling me whether the approach road was paved or gravel, whether the farmhouse the tree stood beside had bay windows or not, and, oh yes, "There is a woodpecker hole on the northeast side of the trunk." When I learned of his death, I feared that all of this had been lost. Much of it has, of course, been lost, but not all. Through the kindness of his family and the efforts of friends George and Kathleen Thomson, his meticulous and voluminous notes were preserved. The notes contained information on 3734 individual trees and shrubs in Michigan. In some cases the measurements were exact and the locations were precise. In other cases, measurements were approximations and locations were described only in cryptic hints.

It has taken two and a half years to sort through Paul Thompson's records. In addition to *The Michigan Botanist* series of articles, this paper, updating Paul's 1994 list of champions, is a result of that work. The four or five largest of each species have been entered into a computer database. There are now more than 850 individual trees and shrubs in the database, and it can be accessed by contacting David Steen at <steen@andrews.edu>. The database will also eventually be accessible through the Michigan Botanical Club Web site. The 227 items in this list of champions are a subset extracted from the larger database. This list contains information on 208 State Champions, including 60 National Champi-

ons. National Champion status is based on a point system in which the girth in inches at 4.5 feet above the ground is added to the height in feet and 1/4 of the crown spread in feet. State Champion status is based on girth alone.

Most of these champions were discovered by Paul Thompson and the people who worked with him. Through their efforts, Michigan has more recorded National Champions standing within its borders than any other state except California, Florida, and Texas, in each of which grow a good many species that are not found elsewhere. This paper is dedicated to the memory of Paul Thompson and in salute to his outstanding contributions to Michigan botany and to the Michigan Botanical Club.

THE MICHIGAN BOTANIST BIG TREE ARTICLES

With the agreement of the editor of *The Michigan Botanist* and the endorsement of the Michigan Botanical Club Board of Directors, a series of articles on Michigan's big trees was started in *The Michigan Botanist* in 1992 (see Table 1).

Each article provides a description and illustration of the species along with the location of Michigan's champion, directions on how to reach it, and its most recent measurements. The third paper in this series reports on a tree that has since been lost in a storm. Reprints of these articles are available from the author.

HOW TO MEASURE AND REPORT A BIG TREE

State Champion trees are determined by measuring the circumference of the trunk, in inches, at 4.5 feet above the ground. National Champion determination is based on a point system, with the number of points obtained by adding the circumference of the trunk, in inches, 4.5 feet above the ground to the height in feet and 1/4 of the average crown spread in feet.

The circumference of the trunk is usually the easiest measurement to make. A tape can be run around the trunk at 4.5 feet above the ground or a string can be used if a long tape is not available. In situations where the tree grows on a steep slope there may be some uncertainty as to just where on the trunk 4.5 feet comes. In these cases, it is best to measure the circumference at 4.5 feet on both the upslope and downslope sides and average them. If a tree trunk branches below 4.5 feet, the circumference of only the largest branch should be measured.

The height is best determined by using an inclinometer, Abbey Hand Level, transit, or other instrument for measuring the angle formed by sighting the base and top of the tree. If this angle is measured 100 feet from the tree a table of tangents can be used to convert the number of degrees of the angle to the height of the tree in feet. If, for instance, the angle is measured as 30 degrees, and you look up 30 degrees in a table of trigonometric functions, you will find that the tangent of 30 degrees is 0.577. The tree is 57.7 feet high. If instruments to measure the angle are not available, you can use a straight stick. Hold the stick vertically at

Table 1. The Michigan Botanist Big Tree Articles, Published & Submitted

Article #	Mich. Bot. Volume, Pages & Year
1. Populus balsamifera L. Balsam Poplar	31: 112–114 (1992)
2. Populus tremuloides Michx. Quaking Aspen	32: 232–234 (1993)
3. Quercus bicolor Willd. Swamp White Oak	32: 266–268 (1993)
4. Pinus banksiana Lamb. Jack Pine	33: 19–21 (1994)
5. Pinus resinosa Ait. Red Pine	33: 69–71 (1994)
6. Magnolia acuminata (L.) L. Cucumber Tree	33: 91–93 (1994)
7. Quercus alba L. White Oak	33: 125–127 (1994)
8. Quercus rubra L. Red Oak	34: 79–81 (1995)
9. Ginkgo biloba L. Ginkgo	34: 133–134 (1995)
10. Tilia americana L. Basswood	34: 141–143 (1995)
11. Fraxinus pennsylvanica Marsh. Red Ash	34: 144–146 (1995)
12. Morus rubra L. Red Mulberry	34: 147–149 (1995)
13. Quercus macrocarpa Michx. Bur Oak	35: 27–29 (1996)
14. Gleditsia triacanthos L. Honeylocust	35: 51–53 (1996)
15. Populus deltoides Marsh. Cottonwood	35: 54–56 (1996)
16. Salix nigra Marsh. Black Willow	In press
17. Pinus nigra var. austriaca (Hoess.) Aschers. Black Pine	" "
18. Fraxinus americana L. White Ash	" "
19. Acer platanoides L. Norway Maple	" "
20. Ostrya virginiana (Miller) K. Koch Ironwood or Hop-hornbeam	" "
21. Castanea dentata (Marsh.) Bork. American Chestnut	" "
22. Fagus grandifolia Ehrh. American Beech	" "
23. Acer saccharum Marsh. Sugar Maple	" "
24. Taxodium distichum (L.) Rich. Bald-cypress	" "
25. Sequoiadendron giganteum (Lindl.) Buckholz Giant sequoia	" "
26. Acer pseudoplatanus L. Sycamore Maple	" "

arm's length, making sure that the length of stick above your hand equals the distance from your hand to your eye. Back away from the tree on ground level with the base of the tree. When you are far enough from the tree that you can sight over your hand to the base of the tree and over the top of the stick to the top of the tree, you are at a distance from the tree equal to the height of the tree.

The average crown spread can be measured by examining the farthest extent of the crown on all sides of the tree. You then measure the tip-to-tip distance across the largest crown length. Do the same across the shortest tip-to-tip crown distance and average the two. The average is known as the average crown spread.

To report a big tree, first determine the identity of the tree. It will not be sufficient to say "It is some kind of oak." You should send leaves, twigs, and acorns in with your measurements or prepare a herbarium sheet with a label containing the following information: the Latin name of the tree (if known), the precise location of the tree, your name, and the date on which you collected the specimen. Personnel from your County Forest Extension Service or a nearby college or university should be consulted to help you confirm the identity of the tree. Second, take the measurements described above. If this is not practical, at least measure the girth in inches at 4.5 feet above the ground. It is important that a second person, preferably one with experience in these matters, confirm your measurements. Finally, send the name of the tree, its exact location, and measurements, along with a herbarium specimen or pressed and dried leaves, twigs, and flowers or fruit, if available, to the State's Big Tree Coordinator (for the near future, the author of this paper). This will ensure the inclusion of the tree in the state's Big Tree Inventory. You can always find out the name of the big tree coordinator for any state in the country by contacting the Director, National Big Tree Program, The American Forestry Association, 910 Seventeenth St., NW., Washington D.C. 20006.

COMMENTS ON THE LIST OF THE CHAMPION TREES & SHRUBS OF MICHIGAN

Much of the information in the list of the champion trees and shrubs of Michigan (Table 2) is self-explanatory. Table 3 presents a list of the abbreviations used. Table 4 presents an alphabetical list of the same trees and shrubs by common names to facilitate finding a tree or shrub when only the common name is known. Table 5 presents a list of these same trees and shrubs arranged by county. Where more than one tree is listed, it is likely due to the designation of co-champions or situations where the state and national champions are different trees.

The scientific and common names used in these lists are those used in Voss's three volumes on the flora of Michigan (1972, 1985, 1996) for native plants, and *Hortus Third* (Bailey Hortorium 1976) for cultivated species. Other books and manuals treating the plants known to be growing in the Great Lakes area are Barnes and Wagner (1981), Gleason and Cronquist (1991), Dirr (1983), and Rehder (1951). In most cases there is little uncertainty about what name to use. A few, however, are problematic. Most of these concern hybrids between

species or a difference of taxonomic opinion as to whether the varieties of a species should be recognized as separate species. Unfortunately, both of these types of problems occur in our most common trees, oaks and maples. There are also some cases in which earlier names have been found to be incorrect according to the rules of botanical nomenclature.

The measurements are given as inches at 4.5 feet above the ground for girth, and as feet for height and average crown spread. In most cases these measurements were made in accordance with the specifications given above. Periodically, when a tree is re-measured it is found to have a lesser height or average crown spread. This is usually due to a loss of branches caused by a storm since the earlier measurements were made. The date of the most recent measurement is given in the last column of Table 2.

The Town column of Table 2 may indicate the city or, where more useful, the name of the township in which a tree or shrub exists. For some entries, a state park may be listed or the name of a lake given if it is likely to be helpful in finding the location.

The location column provides the best information available in the state's big tree records. In many cases it is both exact and accurate, e.g., a street address or intersection. In other cases, the information is more vague, e.g., near Sleeping Bear Dunes.

IMPROVING THE LISTS

The four greatest ways in which the current lists can be improved lie in: 1.) determining if a listed tree or shrub still exists, 2.) determining the correct identification of each tree and shrub, 3.) obtaining exact and accurate information on the location of each tree or shrub listed, and 4.) obtaining up-to-date measurements. It is hoped that users of the list will continue to supply such information to the State's Big Tree Coordinator and that each succeeding version of these lists will be better than the last.

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Table 2. The Champion Trees and Shrubs of Michigan. Measurements of girth are in inches at 4.5 feet above the ground and those of height and average crown spread are in feet. *Indicates a National Champion

Genus & Species	*Common Name*	*Girth*	*Height*	*Crown*	*County*	*Town*	*Location*	*Year*
Abies								
A. balsamea	Fir, Balsam	84	116	33	Ontonogon	Porc Mt St Pk	Gov't Pk Trail	1961
A. concolor	Fir, White	88	92	37	Ionia	Saranac	S side of cemetery	1996
Acer								
A. campestre	Maple, Hedge	100	54	45	Kalamazoo	Gull Lake	Kellogg Bio. Station	1989
A. ginnala	Maple, Amur	72	30	44	Washtenaw	Ann Arbor	#1 Regent Place	1995
A. griseum	Maple, Paperbark	37	27	28	Washtenaw	Ann Arbor	925 Aberdeen	1995
A. negundo*	Box-elder	214	110	127	Washtenaw	NW of Milan	Saline & Mooreville Rds	1972
A. negundo	Box-elder	219	100	117	Livingston	Cohoctah	N of Howell	1980
A. nigrum*	Maple, Black	198	118	127	Allegan	Thomas & Jackson Sts	W bank of Kalamazoo R	1968
A. pensylvanicum	Maple, Striped	44	59	43	Marquette	Huron Mt Club	S Rush Lk Tr	1973
A. platanoides	Maple, Norway	173	80	75	Leelanau	Empire	Fred Taghorn Res, Front St	1995
A. pseudoplatanus	Maple, Sycamore	111	53	54	Manistee	Lake Bluff	2890 Lk Shore Dr (Audubon Ctr)	1995
A. rubrum*	Maple, Red	222	179	120	St. Clair	St. Clair	6700 Puttygut Rd	1984
A. saccharinum	Maple, Silver	297	79	77	Oakland	N of Rochester	405 W Stony Creek Rd 1/2 mi W of Rochester Rd	1997
A. saccharum	Maple, Sugar	225	78	80	Manistee	E of Bear Lake	Big 4 Road	1995
A. spicatum*	Maple, Mountain	33	58	31	Houghton	2 mi SE Beacon Hill	Sec 32 T55N R35W	1979
A. spicatum	Maple, Mountain	34	64	38	Marquette	Huron Mt Club	Howe Lake Area	
Aesculus								
A. glabra	Buckeye, Ohio	134	104	58	Lenawee	Adrian	E of Maple, 420 N Maple	
A. hippocastanum	Horse-Chestnut	189	77	85	Washtenaw	W of Ann Arbor	10395 Jerusalem St., Chelsea	1967
A. octandra	Buckeye, Yellow	102	62	60	Kalamazoo	Gull Lake	Kellogg Bio. Station	1989
A. pavia*	Buckeye, Red	91	64	52	Kalamazoo	Vicksburg	Prudential Nursery	1965
Ailanthus								
A. altissima	Tree-of-Heaven	162	50	40	St. Clair	Maryville	Electric & Sturgis Rd	1988
Alnus								
A. glutinosa	Alder, Black	84	66	45	Wayne	Trenton	Elizabeth Pk, E bank of channel	
A. rugosa*	Alder, Speckled	38	66	56	St. Clair	Avoca	4238 Bricker	
Amelanchier								
A. arborea	Serviceberry, Downy	79	63	74	Barry	6 mi S of Hastings 4 mi NE of Cloverdale	425 Pritchardville	1983

A. laevis	Serviceberry, Smooth	69	42	44	Leelanau	S of Maple City	S.R. 72	1963
A. sanguinea	Serviceberry, New England	16	38	30	Keweenaw	Copper Harbor	M-26 near Ft. Wilkins	1968
Aralia								
A. spinosa	Devil's Walking Stick	19	36	30	Oakland	Bloomfield Hills	Cranbrook Institute of Science	1973
Aronia								
A. prunifolia	Chokeberry	5	18	5	Oakland	N Milford	Highland	1958
Asimina								
A. triloba	Pawpaw	35	48	32	Macomb	S of Utica	Dodge Pk #8	
Betula								
B. alleghaniensis	Birch, Yellow	178	114	101	Mackinac	Gould City	8 mi S, 1/2 mi E of Rd	1971
B. alleghaniensis	Birch, Yellow	187	106	84	Marquette	Huron Mt Club	N trail	1975
B. nigra	Birch, River	115	58	70	Washtenaw	Ann Arbor	1515 Granger	1995
B. papyrifera*	Birch, Paper	220	107	76	Cheboygan			
B. papyrifera var. cordifolia*	Birch, Mt. Paper	112	67	80	Leelanau	W of Glen Lake	Near Sleeping Bear Dunes, Harwood Rd	1993
B. pendula	Birch, European White	158	78	71	Leelanau	NW of Traverse City	9510 Cherry Bend Rd	1995
B. populifolia	Birch, Gray	72	69	54	Kalamazoo	Gull Lake	Kellogg Bio. Station	1989
B. ×purpusii	Birch, Hybrid	18	31	14	Jackson	N side of Brill Lake	.22 mi W of Lutz Rd	1975
Carpinus								
C. caroliniana	Hornbeam, American, or Bluebeech	69	41	33	Oakland	Bloomfield Hills	4511 Lane Lake Rd	1996
Carya								
C. cordiformis	Hickory, Bitternut	170	101	79	Shiawassee	Owosso Ctry Club	4 mi N of Owosso	1984
C. glabra	Hickory, Pignut	144	70	60	Ingham		2 mi W of Stockbridge	
C. illinoinensis	Pecan	174	70	68	Kalamazoo	Gull Lake`	Kellogg Bio. Station	1989
C. laciniosa	Hickory, Shellbark	108	96	100	Washtenaw	S of Saline, N of Tecumseh	Arkona & Macon Rds	1963
C. ovata	Hickory, Shagbark	136	76	38	Calhoun	W of Marshall	Baker Sanitarium	1966
Castanea								
C. dentata	Chestnut, American	208	64	80	Grand Traverse		18367 Old Mission Rd	1995
Catalpa								
C. bignonioides	Catalpa, Southern	202	74	67	Kent	Sparta	101 W Division St	
C. speciosa*	Catalpa, Northern	242	107	85	Ingham	Lansing	State Capitol Grounds	1970
C. speciosa	Catalpa, Northern	197	63	62	Ionia	Portland	521 Looking Glass Rd	1966

Genus & Species	*Common Name*	*Girth*	*Height*	*Crown*	*County*	*Town*	*Location*	*Year*
Celtis								
C. occidentalis	Hackberry, Northern	188	83	105	Wayne	Lower Huron Metro Pk	1 mi S of Nature Center	1966
Cephalanthus								
C. occidentalis	Buttonbush	35	35	25	Oakland	Bloomfield Hills	Ward Preserve	1973
Cercidophyllum								
C. japonicum	Katsura Tree	42	43	32	Washtenaw	Ann Arbor	#1 Regent Place	1995
Cercis								
C. canadensis	Redbud, Eastern	87	29	36	Washtenaw	Ann Arbor	1605 Morton	1995
Chionanthus								
C. virginicus	Fringe Tree	24	18	25	Grand Traverse	Traverse City	State Hospital Grounds	1973
Cladrastis								
C. lutea	Yellow-wood	177	80	96	Washtenaw	Ann Arbor	227 Barton Shores Dr	1980
Cornus								
C. alternifolia*	Dogwood, Alternate-leaved	28	25	20	Oakland	Beverly Hills	17500 Kirkshire Rd	1997
C. foemina var. racemosa	Dogwood, Gray	14	22	15	Wayne	Grosse Isle	24532 E River Rd	1963
C. foemina var. racemosa*	Dogwood, Gray	12	18	8	Oakland	Birmingham	231 Larchlea Rd	1961
C. florida	Dogwood, Flowering	55	55	56	St. Joseph	4.5 mi W of Burr Oak	W side of Presbyterian Church N of rd, W end of small valley	1968
C. purpusii	Dogwood, Silky	6	11	9	Oakland	Beverly Hills	17503 Kirkshire Rd	1964
C. rugosa*	Dogwood, Roundleaf	11	40	16	Leelanau	Good Harbor Bay	S of Zeeland, nr M-22, S of Duck Ln	1965
C. stolonifera	Dogwood, Red-Osier	10	17	20	Benzie	Frankfort	M-22 & Anderson Rds	
Corylus								
C. americana*	Hazelnut, American	16	31	33	Oakland	Bloomfield Hills	Lone Pine & 491 Martell Rd	1989
Cotinus								
C. coggygria	Smoketree	26	17	23	Oakland	Ferndale	1728 Pinecrest Rd at 9 Mile Rd	1976
Crataegus								
C. crus-galli	Cockspur thorn	38	29	23	Wayne	Livonia	Rear of 34001 Ann Arbor Tr	1959
C. douglasii	Hawthorn, Black	40	25	8	Chippewa	Sugar Island		1964
C. mollis*	Hawthorn, Downy	98	33	44	Wayne	Grosse Ile	8120 Macomb	1963
C. monogyra	Hawthorn, Oneseed or English	43	52	30	Wayne	Trenton	Elizabeth Park (N)	1975

C. phaenopyrum	Hawthorn, Washington	16	36	19	Oakland	Beverly Hills	17503 Kirkshire	1982
C. punctata	Hawthorn, Dotted	50	39	52	Oakland	Bloomfield Hills	S end of Guilford Rd	1959
C. sp.	Hawthorn	73	36	45	Wayne	Grosse Ile	19903 Park Lane	1964
C. succulenta	Hawthorn, Fleshy	26	42	42	Keweenaw	Delaware	Montreal River	
Diospyros								
D. virginiana	Persimmon	70	69	47	Kent	Grand Rapids	1715 N Center	
Dirca								
D. palustris	Leatherwood	13	11	8	Leelanau	S of Empire	High Dunes (S)	1957
Elaeagnus								
E. angustifolia	Russian-Olive	115	58	59	Oakland	Bloomfield Hills	459 Martell Dr	1982
Euonymus								
E. alata	Euonymus, Winged	10	16	32	Lenawee	Adrian (?)	Oakwood Cemetery	
E. atropurpurea*	Burning-Bush	22	32	29	Oakland	N of Utica	flood plain	
E. europaea	Spindle Tree	65	45	33	Wayne	Trenton	Elizabeth Park	
Fagus								
F. grandifolia	Beech, American	193	98	106	Manistee	Onekema	9017 Clark Rd	1995
F. sylvatica var. atropunicea	Beech, Copper	188	86	72	Jackson	Jackson	N Blackstone & VanBuren Sts	1997
F. sylvatica var. pendula	Beech, European Weeping	111	86	90	Oakland	Pontiac	Franklin & W Huron	1991
Fraxinus								
F. americana	Ash, White	243	100	61	Antrim	S of Elk Rapids	11347 Hanel Rd	1995
F. nigra*	Ash, Black	135	155	108	Lenawee	Adrian	N of Island Pk Section 23	1983
F. pennsylvanica*	Ash, Red	259	95	95	Cass	N of Dowagiac	Topash & Townline Rd	1992
F. quadrangulata	Ash, Blue	105	90	35	Cass	NE of Cassopolis	58652 Decatur Rd, West Side	1997
Ginkgo								
G. biloba	Ginkgo	147	80	60	Hillsdale	Hillsdale	Public Library	1993
Gleditsia								
G. triacanthos*	Honey-Locust	223	78	74	Wayne	Grosse Ile	24532 E River Rd	1992
G. triacanthos var. inermis*	Locust, Thornless	198	116	104	Lenawee	W of Adrian	S edge of M-34	1985
Gymnocladus								
G. dioicus	Coffee-tree, Kentucky	169	112	109	Van Buren	Hartford	409 Haver	
Halesia								
H. tetraptera	Silverbell	18	29	40	Genesee	SW of Flint	3270 Hill Rd	1976

Genus & Species	*Common Name*	*Girth*	*Height*	*Crown*	*County*	*Town*	*Location*	*Year*
Hamamelis								
H. virginiana	Witch-Hazel	17	43	41	Muskegon	Muskegon St Pk	Deep Valley (E Trail)	1974
Ilex								
I. opaca	Holly, American	27	25	20	Macomb	Mt Clemens	114 N North Ave	1989
I. verticillata	Holly, Michigan	10	18	14	Washtenaw	Long Lake	Waterloo Recr Area	1965
Juglans								
J. cinerea	Butternut	189	103	86	Hillsdale	NW of Hudson	1389 Culbert Rd	1989
J. nigra	Walnut, Black	266	121	119	Kalamazoo	Kalamazoo	6565 W H Ave	1997
J. regia	Walnut, English	89	50	70	Washtenaw	Ann Arbor	2815 Brockman	1995
Juniperus								
J. communis*	Juniper, Common	37	46	28	Washtenaw	Chelsea	5 mi N of Chelsea	
J. communis var. depressa	Juniper, Ground	17	18	8	Leelanau	Glen Haven	Near Sleeping Bear Dunes (upper)	1965
J. virginiana	Red-Cedar, Eastern	111	66	28	Ionia	Portland State Game Area	Along River bank	1991
Koelreuteria								
K. paniculata	Golden-rain Tree	58	38	33	Genesee	Flint	3270 W Hill Rd, Genessee Nursery	1975
Larix								
L. decidua	Larch, European	124	84	90	Lenawee	.3 mi NE of Macon	Macon Rd	
L. laricina	Tamarack	109	89	64	Lake	Luther	Pond 1 mi E, end of road	
Lindera								
L. benzoin	Spicebush	10	23	18	Wayne	Detroit	Belle Isle Nr Center-Vista Ave	1965
Liquidambar								
L. styraciflua	Sweetgum	68	83	70	Grand Traverse	Traverse City	State Hospital	
Liriodendron								
L. tulipifera	Tulip-tree	239	105	90	Wayne	Lower Huron Metro Pk	Tulip-tree Trail	1989
Maclura								
M. pomifera	Osage-orange	168	50	45	Berrien	Coloma	Edge of town	1973
Magnolia								
M. acuminata	Cucumber-tree	164	70	75	Berrien	Bertrand Twp	3110 Spirea Rd	1993
M. ×soulangiana	Magnolia, Saucer	41	26	32	Washtenaw	Ann Arbor	312 S Division	1995
Malus								
M. angustifolia	Apple, Southern Crab	20	18	33	Wayne	Cass Benton Pk	1 mi S of 7 Mile Rd	1966

M. coronaria	Apple, Sweet Crab	26	28	33	Wayne	Plymouth	Middle Rouge Pkwy	1966
M. ioënsis*	Crab, Prairie	33	33	28	Oakland	Beverly Hills	17503 Kirkshire	1971
M. pumila	Apple, Common	138	31	34	Oakland	Bloomfield Hills	Telegraph & W Quarton Rds	1997
M. sylvestris	Apple, Crab	122	52	48	Oakland	Bloomfield Hills	4359 Oak Grove, Wing Lake	1992
Metasequoia								
M. glyptostroboides	Redwood, Dawn	104	86	38	Ingham	East Lansing	MSU-Beal Gardens	1996
Morus								
M. alba	Mulberry, White	252	76	79	Lenawee	E of Morenci	5600 E Mulberry, .5 mi E of Pense	1981
M. rubra	Mulberry, Red	174	56	49	Berrien	E of Bridgman	Jericho & Shawnee Rds	1994
M. rubra	Mulberry, Red	204	104	106	Ottawa	Jenison	1421 Baldwin	
Nemopanthus								
N. mucronatus*	Holly, Mountain	13	20	10	Oakland	Highland	Fish Lake Bog	1960
Nyssa								
N. sylvatica	Tupelo, Black, or Sour-gum	140	65	49	Washtenaw		N of Cassidy Lake	
Ostrya								
O. virginiana*	Ironwood, Hop-hornbeam	115	47	50	Grand Traverse	S of Monroe Center	1/2 mi W of 633 on N side of Miller Road	1995
Picea								
P. abies	Spruce, Norway	145	98	78	Oakland	Novi	21937 Novi Rd S of 9 Mile Rd	1960
P. glauca	Spruce, White	104	102	32	Marquette	Huron Mt Club	Rush Lake	
P. mariana	Spruce, Black	57	63	39	Isabella	S of Farwell	.4 S of Heritage Rd, Section 10 Gilmore Twp	1964
Pinus								
P. banksiana	Pine, Jack	97	70	48	Iron	Iron River	Sec 28 T42N R32W	1980
P. banksiana	Pine, Jack	93	68	30	Marquette	16 mi S of Marquette	W Br Escanaba River	1993
P. nigra	Pine, Austrian	119	73	59	Grand Traverse	Traverse City	State Hospital Grounds	1995
P. nigra	Pine, Austrian	138	65	40	Ingham	East Lansing	MSU-across from the Student Union	1996
P. resinosa*	Pine, Red	124	124	60	Gogebic	Watersmeet	Sylvania tract, NE of Loon Lake	1993
P. strobus*	Pine, Eastern White	186	201	62	Marquette	Huron Mt Club	Fisher Ck Tr	
P. strobus*	Pine, Eastern White	202	181	52	Marquette	Huron Mt Club	Fisher Ck Tr	
P. sylvestris*	Pine, Scots	186	64	52	Lenawee	Sand Creek	5384 Sand Creek Rd	1972

Genus & Species	*Common Name*	*Girth*	*Height*	*Crown*	*County*	*Town*	*Location*	*Year*
Platanus								
P. occidentalis	Sycamore	225			Kalamazoo	Comstock	Kings Hwy .1 mi W of River St (in park)	1983
Populus								
P. alba	Poplar, White	239	86	126	Charlevoix	S of Charlevoix	Barnard Rd, 2 mi S of US-31	
P. balsamifera*	Poplar, Balsam	165	128	57	Marquette	Champion	US-41	1991
P. deltoides	Cottonwood, Eastern	343	107	92	Wayne	Wayne	Near Michigan & Josephine	1992
P. grandidentata*	Aspen, Bigtooth	105	132	67	Marquette	Huron Mt Club	Fisher Creek Trail	1984
P. grandidentata	Aspen, Bigtooth	118	97	66	Marquette	Huron Mt Club	Mt Homer Trail	1972
P. nigra var. italica	Poplar, Lombardy	196	81	20	Schoolcraft		2 mi S of Fayette; pk entr	1989
P. tremuloides	Aspen, Quaking	122	109	56	Ontonagon	Porc Mt St Pk	S Boundary Road	1991
Prunus								
P. americana	Plum, Wild American	36	35	35	Oakland	S of Lakeville		
P. armeniaca	Apricot	123	54	63	Leelanau	Sutton's Bay	Solem Rd just E of Stave Rd	1969
P. avium	Cherry, Sweet	116			Ingham	Lansing	622 Clemens Rd	1996
P. cerasus*	Cherry, Common Sour	119	68	75	Calhoun	3 mi N of Homer	7821 22 Mile Rd	1963
P. nigra*	Plum, Canada	50	51	48	Macomb	S of Utica	Sterling Hts Pk	1959
P. pensylvanica	Cherry, Pin	47	95	22	Kalamazoo	Kalamazoo	Fischer Woods, Douglas Rd	1996
P. serotina*	Cherry, Wild Black	183	82	36	Washtenaw	S of Ypsilanti	N end of Pineview Rd	1997
P. serotina	Cherry, Wild Black	195	74	90	Cass	N of Dowagiac	54622 Rudy St	1995
P. virginiana	Cherry, Choke	86	73	67	Wayne	Detroit	NE corner of Curtis & McIntire	1996
Pseudotsuga								
P. menziesii	Douglas-fir	62	72	36	Washtenaw	Ann Arbor	1155 Arlington	1995
Ptelea								
P. trifoliata*	Hop-tree	24	17	28	Kent	Ada	Community Park (Thornapple)	1989
P. trifoliata	Hop-tree	30	31	32	Kent	Ada	Community Park (Thornapple)	1989
Pyrus								
P. communis	Pear, Common	136	35	56	Wayne	Dearborn Hts	24600 Ann Arbor Tr	1972
Quercus								
Q. alba	Oak, White	260	84	125	Allegan	Allegan	1308 Ely St	1993
Q. bicolor	Oak, Swamp White	248	129	128	Wayne	Canton Twp	Rouge Br (SW of Palsar & Sheldon)	1988
Q. bicolor × prinus	Oak, ?	130	99	116	Livingston	Howell	Grand River E of Jewett	1975

Q. coccinea	Oak, Scarlet	243	117	126	Hillsdale	E of Jonesville	N Adams Rd	
Q. ellipsoidalis	Oak, Northern Pin	139	103	115	Oakland	S of Lake Orion	Bald Mt Rd S of Greenleaf	
Q. imbricaria	Oak, Shingle	140	116	117	Calhoun	SW of Albion	22 Mile Rd & D Dr S	
Q. macrocarpa	Oak, Bur	288	92	106	Berrien	Niles	702 Chippewa Trail	1994
Q. muehlenbergii	Oak, Chinkapin	215	120	132	Washtenaw	Ann Arbor	Wurster Park	
Q. palustris	Oak, Pin	159	106	101	Wayne	Dearborn	24824 Fairmont	1970
Q. prinoides	Oak, Dwarf Chestnut	23	46	23	Berrien	Warren Dunes St Pk	W at Lake Price and Stream	1960
Q. robur	Oak, English	155	81	76	Benzie	Benzonia	Case near Homestead	1975
Q. rubra	Oak, Red	276	100	87	Allegan	Saugatuck	329 St. Joseph	1993
Q. velutina*	Oak, Black	247	131	137	St. Clair	Algonac	Washington and Clay (school)	1964
Q. ×bebbiana	Oak, Bebb's	155	88	108	Kalamazoo	Battle Creek	Fort Custer	1970
Q. ×bebbiana	Oak, Bebb's	220	73	105	Oakland	Rochester Hills	Livernois and Auburn Roads	1997
Q. ×hawkinsiae	Oak, Hawkins	46			Jackson	Waterloo Recr Area	Nature trail at Hdqs	1966
Q. ×jackiana	Oak, Jack	165	118	137	Livingston	Howell	Grand R (503)	1975
Q. ×runcinata*	Oak, Bottom	152	96	106	Branch	Coldwater	338 E Chicago	1975
Q. ×schuettii	Oak, Schuette	240	87	108	Oakland	N Rochester	Letts & Rush	
Rhamnus								
R. cathartica*	Buckthorn, European	45	61	65	Washtenaw	Ann Arbor	N of Huron R, opp Nichols Arb	1972
R. frangula*	Buckthorn, Glossy	20	40	25	Oakland	Bloomfield Hills	Cranbrook Institute of Science	1975
R. frangula	Buckthorn, Glossy	23	35	22	Oakland	Pleasant Ridge	20 Kemberton	1967
Rhus								
R. copallina*	Sumac, Shining	20	33	20	Kalamazoo	Vicksburg	Prudential Nursery	1975
R. glabra	Sumac, Smooth	13	18	23	Hillsdale	1 mi S of Somerset Ctr	Waldron Rd., edge of fen	1986
R. typhina	Sumac, Staghorn	41	25	25	Cass	Cassopolis	405 Smith St	
Robinia								
R. pseudoacacia	Locust, Black	234	96	85	Hillsdale	7 mi NE Pittsford	1334 Stewart	1972
Salix								
S. alba*	Willow, White	301	133	142	Oakland	2 mi N of New Hudson	Maple Rd 200 ft E of Milford Rd	1990
S. alba var. vitellina*	Willow, Golden	343	70	51	Oakland	Lyon Twp, W of New Hudson	60690 Pontiac Tr	1962
S. amygdaloides	Willow, Peachleaf	134	111	143	St. Clair	Algonac	State Park	1989
S. babylonica*	Willow, Weeping	344	86	93	Livingston	Hartland	4450 Bullard Rd	
S. bebbiana	Willow, Bebb's	36	31	18	Leelanau	N of Maple City	S Lime Lake Rd	1960
S. discolor*	Willow, Pussy	54	47	33	Clinton	St. Johns	718 S Lansing	1980
S. discolor	Willow, Pussy	56	32	28	Shiawassee	2.5 mi S of Laingsburg	9860 Woodbury Rd	1996

Genus & Species	*Common Name*	*Girth*	*Height*	*Crown*	*County*	*Town*	*Location*	*Year*
S. exigua	Willow, Sandbar	28	42	23	Macomb		Footbridge, Utica Recr Area	1967
S. fragilis*	Willow, Crack	305	122	124	Macomb	NW of Utica	Utica Recr Area, S side of bridge E side of river	1964
S. fragilis*	Willow, Crack	310	116	131	Oakland	Beverly Hills		
S. fragilis	Willow, Crack	338	82	94	Oakland	Beverly Hills	Douglas, 31805 Evergreen Rd	1985
S. lucida*	Willow, Shining	130	74	81	Grand Traverse	Traverse City	State Hospital	1960
S. matsudana	Willow, Corkscrew	66	73	44	Leelanau	Northport	202 Waukazoo St	1995
S. nigra*	Willow, Black	400	76	92	Grand Traverse	Traverse City	State Hospital (W side)	1995
S. petiolaris*	Willow, Meadow	13	34	18	Leelanau		Traverse Lake (East shore)	1975
S. purpurea*	Willow, Purple-osier or Basket	15	37	49	Leelanau	W of Omena	NW corner of Putnam & Coiltery (#629)	1971
S. pyrifolia	Willow, Balsam	11	15	8	Chippewa	Sugar Island		
S. serissima*	Willow, Autumn	35	48	44	Oakland	Birmingham	Northlawn & Cranbrook Rds	
Sambucus								
S. canadensis	Elderberry, Common	14	26	18	Leelanau	Cedar City	Swamp along RR	1976
S. pubens*	Elderberry, Red	20	27	15	Keweenaw	Lac La Belle	2 mi NE	1972
Sassafras								
S. albidum	Sassafras	182	78	64	Jackson	Jackson	1318 Coddington Ln	1984
Sequoiadendron								
S. giganteum	Sequoia, Giant	151	89	30	Manistee	Lake Bluff Audubon	2890 Lakeshore Drive	1995
Sophora								
S. japonica	Pagoda-Tree, Japanese	136	102	110	Monroe	Monroe	Elm St & US-25; St. Mary's	1970
Sorbus								
S. americana	Mountain-ash, American	62	57	35	Houghton	Lorus Pt	Little Traverse Bay on Kew. Bay	1984
S. aucuparia	Mountain-ash, European	56	32	25	Grand Traverse		8641 US-31 North	1996
S. decora*	Mountain-ash, Showy	57	58	32	Mackinac	7 mi S Gould City	SW1/4 NE1/4 Sec 33	1972
S. decora	Mountain-ash, Showy	63	37	35	Houghton	N of Acme	Calvert St S of 3rd St	1966
Staphylea								
S. trifolia*	Bladdernut, American	19	36	37	Macomb	NW of Utica	Utica Recr Area, S end	1965
Syringa								
S. vulgaris	Lilac	55	27	29	Mackinac	St. Ignace	332 Pt La Barbe Rd	1987
Taxodium								
T. distichum	Cypress, Bald	116	68	34	Kalamazoo	Kalamazoo	Kleinstuck Preserve	1996

Thuja								
T. occidentalis*	White-Cedar, Northern	216	113	42	Leelanau	S Manitou Island	Valley of Giants	
Tilia								
T. americana	Basswood	275	57	68	Ingham	SE of Dansville	S side of M-36	1993
Toxicodendron								
T. vernix	Sumac, Poison	13	21	12	Oakland	SE of Lakeville	Lakeville Swamp	1964
Tsuga								
T. canadensis	Hemlock, Eastern	164	121	62	Emmet	S of Cross Village	316 Petoskey	1981
T. caroliniana	Hemlock, Carolina	95	81	62	Oakland	Bloomfield Hills		
Ulmus								
U. americana*	Elm, American	282	112	116	Wexford	3 mi NW of Buckley	Wilson Rd, 1.5 mi N of county line	1997
U. glabra	Elm, Wych	261	87		Ingham	MSU	Yakeley Hall & West Circle Dr	1996
U. parvifolia	Elm, Chinese Lacebark	76	56	68	Washtenaw	Ann Arbor	1605 E Stadium	1995
U. procera	Elm, English	179	76	48	Washtenaw	Ann Arbor	2100 Devonshire	1995
U. pumila	Elm, Siberian	234	94	92	Ottawa	Zeeland	370 E Rich Road on the N side of Bus. I-96	1996
U. rubra	Elm, Slippery	160	140	97	Oakland	Haven Hill	Swamp, NE end	1958
U. serotina	Elm, September	98	71	70	Wayne	Trenton	Elizabeth Park	1965
U. serotina	Elm, September	102	74	68	Wayne	Trenton	Elizabeth Park	1965
U. thomasii	Elm, Rock	203	90	81	Grand Traverse	Traverse City	213 Elmwood	1996
Viburnum								
V. alnifolium	Hobble-Bush	10	18	15	Wayne	Trenton	Elizabeth Pk, E of Lagoon	1975
V. lentago*	Nannyberry	34	50	40	Oakland	Bloomfield Hills`	N of Cranbrook Institute of Science	
V. opulus var. americanum*	Highbush-Cranberry	18	25	25	Wayne	Trenton	Elizabeth Pk, W of Lagoon	1975
V. opulus var. americanum*	Highbush-Cranberry	10	32	31	Wayne	Grosse Isle	Westcroft Gardens Lane	1985
V. opulus var. americanum	Highbush-Cranberry	10	32	31	Oakland	Bloomfield Hills	Cranbrook Institute of Science	
V. prunifolium	Black Haw	17	24	27	Oakland	SW Lakeville	Cedar Swamp	1962
Zanthoxylum								
Z. americanum*	Prickly-Ash	15	28	38	Oakland	Beverly Hills	Route Pk, W of Evergreen	1978

Table 3. Alphabetical list of abbreviations used in the List (Table 2) of the Champion Trees and Shrubs of Michigan.

Arb	Arboretum
Bet	Between
Blvd	Boulevard
Br	Branch
Bus.	Business
Cranbrook Inst. Sci.	Cranbrook Institute of Science
Ck	Creek
Co	County
Ctr	Center
Ctry	Country
E	East
Dr	Drive
Eliz Park	Elizabeth Park
Entr	Entrance
Gov't	Government
Gr Traverse	Grand Traverse
Hdqs	Headquarters
HS	High School
Hse	House
Hts	Heights
Huron Mt Club	Huron Mountain Club
Hwy	Highway
Isl	Island
Jct	Junction
Kal	Kalamazoo
Kellogg Bio. Station	Kellogg Biological Station
Kew	Keweenaw
Lk	Lake
Ln	Lane
Mi	Mile
Mt	Mountain
N	North
Nat	Nature
Nat'l	National
Nr	Near
Opp	Opposite
Penin	Peninsula
Pk	Park
Pkwy	Parkway
Porc Mt St Pk	Porcupine Mountain State Park
Pres	Preserve
Presb	Presbyterian
Pt	Point
Pte	Pointe
R	River
Rd	Road
Recr	Recreation
Res	Residence
Rte or Rt	Route
RR	Railroad
S	South
Sec	Section
Sm	Small
S.R.	State Road

Table 3. Continued

St.	Saint
St	Street
St Pk	State Park
Subdiv	Subdivision
Tr	Trail
Twp	Township
Utica Recr Area	Utica Recreation Area
W	West

Table 4. Common Names of Michigan's Champion Trees and Shrubs

Common Name	*Genus/Species*
Alder, Black	Alnus glutinosa
Alder, Speckled	Alnus rugosa
Apple, Common	Malus pumila
Apple, Crab	Malus sylvestris
Apple, Southern Crab	Malus angustifolia
Apple, Sweet Crab	Malus coronaria
Apricot	Prunus armeniaca
Ash, Black	Fraxinus nigra
Ash, Blue	Fraxinus quadrangulata
Ash, Red	Fraxinus pennsylvanica
Ash, White	Fraxinus americana
Aspen, Bigtooth	Populus grandidentata
Aspen, Quaking	Populus tremuloides
Basswood	Tilia americana
Beech, American	Fagus grandifolia
Beech, Copper	Fagus sylvatica var. atropunicea
Beech, European Weeping	Fagus sylvatica var. pendula
Birch, European White	Betula pendula
Birch, Gray	Betula populifolia
Birch, Hybrid	Betula ×purpusii
Birch, Mt. Paper	Betula papyrifera var. cordifolia
Birch, Paper	Betula papyrifera
Birch, River	Betula nigra
Birch, Yellow	Betula alleghaniensis
Black Haw	Viburnum prunifolium
Bladdernut, American	Staphylea trifolia
Bluebeech	Carpinus caroliniana
Box-elder	Acer negundo
Buckeye, Ohio	Aesculus glabra
Buckeye, Red	Aesculus pavia
Buckeye, Yellow	Aesculus octandra
Buckthorn, European	Rhamnus cathartica
Buckthorn, Glossy	Rhamnus frangula
Burning-bush	Euonymus atropurpurea
Butternut	Juglans cinerea
Buttonbush	Cephalanthus occidentalis
Catalpa, Northern	Catalpa speciosa
Catalpa, Southern	Catalpa bignonioides
Cherry, Choke	Prunus virginiana
Cherry, Common Sour	Prunus cerasus
Cherry, Pin	Prunus pensylvanica
Cherry, Sweet	Prunus avium
Cherry, Wild Black	Prunus serotina
Chestnut, American	Castanea dentata
Chokeberry	Aronia prunifolia
Cockspur thorn	Crataegus crus-galli
Coffee-tree, Kentucky	Gymnocladus dioicus
Cottonwood, Eastern	Populus deltoides
Crab, Prairie	Malus ioënsis
Cucumber-tree	Magnolia acuminata
Cypress, Bald	Taxodium distichum
Devil's Walking Stick	Aralia spinosa
Dogwood, Alternate leaved	Cornus alternifolia
Dogwood, Flowering	Cornus florida

Table 4. Continued

Common Name	*Genus/Species*
Dogwood, Gray	Cornus foemina var. racemosa
Dogwood, Red-osier	Cornus stolonifera
Dogwood, Roundleaf	Cornus rugosa
Dogwood, Silky	Cornus purpusii
Douglas-Fir	Pseudotsuga menziesii
Elderberry, Common	Sambucus canadensis
Elderberry, Red	Sambucus pubens
Elm, American	Ulmus americana
Elm, Chinese Lacebark	Ulmus parvifolia
Elm, English	Ulmus procera
Elm, Rock	Ulmus thomasii
Elm, September	Ulmus serotina
Elm, Siberian	Ulmus pumila
Elm, Slippery	Ulmus rubra
Elm, Wych	Ulmus glabra
Euonymus, Winged	Euonymus alata
Fir, Balsam	Abies balsamea
Fir, White	Abies concolor
Fringe Tree	Chionanthus virginicus
Ginkgo	Ginkgo biloba
Golden-rain Tree	Koelreuteria paniculata
Hackberry, Northern	Celtis occidentalis
Hawthorn	Crataegus sp.
Hawthorn, Black	Crataegus douglasii
Hawthorn, Dotted	Crataegus punctata
Hawthorn, Downy	Crataegus mollis
Hawthorn, English	Crataegus monogyra
Hawthorn, Fleshy	Crataegus succulenta
Hawthorn, Oneseed	Crataegus monogyra
Hawthorn, Washington	Crataegus phaenopyrum
Hazelnut, American	Corylus americana
Hemlock, Carolina	Tsuga caroliniana
Hemlock, Eastern	Tsuga canadensis
Hickory, Bitternut	Carya cordiformis
Hickory, Pignut	Carya glabra
Hickory, Shagbark	Carya ovata
Hickory, Shellbark	Carya laciniosa
Highbush-Cranberry	Viburnum opulus var. americanum
Hobble-bush	Viburnum alnifolium
Holly, American	Ilex opaca
Holly, Michigan	Ilex verticillata
Holly, Mountain	Nemopanthus mucronatus
Honey-Locust	Gleditsia triacanthos
Hop-hornbeam	Ostrya virginiana
Hop-tree	Ptelea trifoliata
Hornbeam, American	Carpinus caroliniana
Horse-Chestnut	Aesculus hippocastanum
Ironwood	Ostrya virginiana
Juniper, Common	Juniperus communis
Juniper, Ground	Juniperus communis var. depressa
Katsura Tree	Cercidophyllum japonicum
Larch, European	Larix decidua
Leatherwood	Dirca palustris
Lilac	Syringa vulgaris

Table 4. Continued

Common Name	*Genus/Species*
Locust, Black	Robinia pseudoacacia
Locust, Thornless	Gleditsia triacanthos var. inermis
Magnolia, Saucer	Magnolia ×soulangiana
Maple, Amur	Acer ginnala
Maple, Black	Acer nigrum
Maple, Hedge	Acer campestre
Maple, Mountain	Acer spicatum
Maple, Norway	Acer platanoides
Maple, Paperbark	Acer griseum
Maple, Red	Acer rubrum
Maple, Silver	Acer saccharinum
Maple, Striped	Acer pensylvanicum
Maple, Sugar	Acer saccharum
Maple, Sycamore	Acer pseudoplatanus
Mountain-ash, American	Sorbus americana
Mountain-ash, European	Sorbus aucuparia
Mountain-ash, Showy	Sorbus decora
Mulberry, Red	Morus rubra
Mulberry, White	Morus alba
Nannyberry	Viburnum lentago
Oak, ?	Quercus bicolor × prinus
Oak, Bebb's	Quercus ×bebbiana
Oak, Black	Quercus velutina
Oak, Bottom	Quercus ×runcinata
Oak, Bur	Quercus macrocarpa
Oak, Chinkapin	Quercus muehlenbergii
Oak, Dwarf Chestnut	Quercus prinoides
Oak, English	Quercus robur
Oak, Hawkins	Quercus ×hawkinsiae
Oak, Jack	Quercus ×jackiana
Oak, Northern Pin	Quercus ellipsoidalis
Oak, Pin	Quercus palustris
Oak, Red	Quercus rubra
Oak, Scarlet	Quercus coccinea
Oak, Schuette	Quercus ×schuettii
Oak, Shingle	Quercus imbricaria
Oak, Swamp White	Quercus bicolor
Oak, White	Quercus alba
Osage-Orange	Maclura pomifera
Pagoda-tree, Japanese	Sophora japonica
Pawpaw	Asimina triloba
Pear, Common	Pyrus communis
Pecan	Carya illinoinensis
Persimmon	Diospyros virginiana
Pine, Austrian	Pinus nigra
Pine, Eastern White	Pinus strobus
Pine, Jack	Pinus banksiana
Pine, Red	Pinus resinosa
Pine, Scots	Pinus sylvestris
Plum, Wild American	Prunus americana
Plum, Canada	Prunus nigra
Poplar, Balsam	Populus balsamifera
Poplar, Lombardy	Populus nigra var. italica
Poplar, White	Populus alba

Table 4. Continued

Common Name	*Genus/Species*
Prickly-Ash	Zanthoxylum americanum
Red-Cedar, Eastern	Juniperus virginiana
Redbud, Eastern	Cercis canadensis
Redwood, Dawn	Metasequoia glyptostroboides
Russian-Olive	Elaeagnus angustifolia
Sassafras	Sassafras albidum
Sequoia, Giant	Sequoiadendron giganteum
Serviceberry, Downy	Amelanchier arborea
Serviceberry, New England	Amelanchier sanguinea
Serviceberry, Smooth	Amelanchier laevis
Silverbell	Halesia tetraptera
Smoketree	Cotinus coggygria
Sour-gum	Nyssa sylvatica
Spicebush	Lindera benzoin
Spindle Tree	Euonymus europaea
Spruce, Black	Picea mariana
Spruce, Norway	Picea abies
Spruce, White	Picea glauca
Sumac, Poison	Toxicodendron vernix
Sumac, Shining	Rhus copallina
Sumac, Smooth	Rhus glabra
Sumac, Staghorn	Rhus typhina
Sweet Gum	Liquidambar styraciflua
Sycamore	Platanus occidentalis
Tamarack	Larix laricina
Tree-of-Heaven	Ailanthus altissima
Tulip-tree	Liriodendron tulipifera
Tupelo, Black	Nyssa sylvatica
Walnut, Black	Juglans nigra
Walnut, English	Juglans regia
White-cedar, Northern	Thuja occidentalis
Willow, Autumn	Salix serissima
Willow, Balsam	Salix pyrifolia
Willow, Bebb's	Salix bebbiana
Willow, Black	Salix nigra
Willow, Corkscrew	Salix matsudana
Willow, Crack	Salix fragilis
Willow, Golden	Salix alba var. vitellina
Willow, Meadow	Salix petiolaris
Willow, Peachleaf	Salix amygdaloides
Willow, Purple-Osier or Basket	Salix purpurea
Willow, Pussy	Salix discolor
Willow, Sandbar	Salix exigua
Willow, Shining	Salix lucida
Willow, Weeping	Salix babylonica
Willow, White	Salix alba
Witch-Hazel	Hamamelis virginiana
Yellow-wood	Cladrastis lutea

Table 5. County list of Michigan's Champion Trees and Shrubs.
*indicates National Champion

Genus/species	*Common Name*
Allegan	
Acer nigrum*	Maple, Black
Quercus alba	Oak, White
Quercus rubra	Oak, Red
Antrim	
Fraxinus americana	Ash, White
Barry	
Amelanchier arborea	Serviceberry, Downy
Benzie	
Cornus stolonifera	Dogwood, Red-Osier
Quercus robur	Oak, English
Berrien	
Maclura pomifera	Osage-Orange
Magnolia acuminata	Cucumber-tree
Morus rubra	Mulberry, Red
Quercus macrocarpa	Oak, Bur
Quercus prinoides	Oak, Dwarf Chestnut
Branch	
Quercus ×runcinata*	Oak, Bottom
Calhoun	
Carya ovata	Hickory, Shagbark
Prunus cerasus*	Cherry, Common Sour
Quercus imbricaria	Oak, Shingle
Cass	
Fraxinus pennsylvanica*	Ash, Red
Fraxinus quadrangulata	Ash, Blue
Prunus serotina	Cherry, Wild Black
Rhus typhina	Sumac, Staghorn
Charlevoix	
Populus alba	Poplar, White
Cheboygan	
Betula papyrifera*	Birch, Paper
Chippewa	
Crataegus douglasii	Hawthorn, Black
Salix pyrifolia	Willow, Balsam
Clinton	
Salix discolor*	Willow, Pussy
Emmet	
Tsuga canadensis	Hemlock, Eastern

Table 5. Continued

Genus/species	*Common Name*
Genesee	
Halesia tetraptera	Silverbell
Koelreuteria paniculata	Golden-rain Tree
Gogebic	
Pinus resinosa*	Pine, Red
Grand Traverse	
Castanea dentata	Chestnut, American
Chionanthus virginicus	Fringe Tree
Liquidambar styraciflua	Sweet Gum
Ostrya virginiana*	Ironwood, Hop Hornbeam
Pinus nigra	Pine, Austrian
Salix lucida*	Willow, Shining
Salix nigra*	Willow, Black
Sorbus aucuparia	Mountain-ash, European
Ulmus thomasii	Elm, Rock
Hillsdale	
Ginkgo biloba	Ginkgo
Juglans cinerea	Butternut
Quercus coccinea	Oak, Scarlet
Rhus glabra	Sumac, Smooth
Robinia pseudoacacia	Locust, Black
Houghton	
Acer spicatum*	Maple, Mountain
Sorbus americana	Mountain-ash, American
Sorbus decora	Mountain-ash, Showy
Ingham	
Carya glabra	Hickory, Pignut
Catalpa speciosa*	Catalpa, Northern
Metasequoia glyptostroboides	Redwood, Dawn
Pinus nigra	Pine, Austrian
Tilia americana	Basswood
Ulmus glabra	Elm, Wych
Ionia	
Abies concolor	Fir, White
Catalpa speciosa	Catalpa, Northern
Juniperus virginiana	Red-Cedar, Eastern
Iron	
Pinus banksiana	Pine, Jack
Isabella	
Picea mariana	Spruce, Black
Jackson	
Betula ×purpusii	Birch, Hybrid
Fagus sylvatica var. atropunicea	Beech, Copper
Quercus ×hawkinsiae	Oak, Hawkins
Sassafras albidum	Sassafras

Table 5. Continued

Genus/species	*Common Name*
Kalamazoo	
Acer campestre	Maple, Hedge
Aesculus octandra	Buckeye, Yellow
Aesculus pavia*	Buckeye, Red
Betula populifolia	Birch, Gray
Carya illinoinensis	Pecan
Juglans nigra	Walnut, Black
Platanus occidentalis	Sycamore
Prunus pensylvanica	Cherry, Pin
Quercus ×bebbiana*	Oak, Bebb's
Rhus copallina*	Sumac, Shining
Taxodium distichum	Cypress, Bald
Kent	
Catalpa bignonioides	Catalpa, Southern
Diospyros virginiana	Persimmon
Ptelea trifoliata*	Hop-tree
Ptelea trifoliata	Hop-tree
Keweenaw	
Amelanchier sanguinea	Serviceberry, New England
Crataegus succulenta	Hawthorn, Fleshy
Sambucus pubens*	Elderberry, Red
Lake	
Larix laricina	Tamarack
Leelanau	
Acer platanoides	Maple, Norway
Amelanchier laevis	Serviceberry, Smooth
Betula papyrifera var. cordifolia*	Birch, Mt. Paper
Betula pendula	Birch, European White
Cornus rugosa*	Dogwood, Roundleaf
Dirca palustris	Leatherwood
Juniperus communis var. depressa	Juniper, Ground
Prunus armeniaca	Apricot
Salix bebbiana	Willow, Bebb's
Salix matsudana	Willow, Corkscrew
Salix petiolaris*	Willow, Meadow
Salix purpurea*	Willow, Purple-osier or Basket
Sambucus canadensis	Elderberry, Common
Thuja occidentalis*	White-Cedar, Northern
Lenawee	
Aesculus glabra	Buckeye, Ohio
Euonymus alata	Euonymus, Winged
Fraxinus nigra*	Ash, Black
Gleditsia triacanthos var. inermis*	Locust, Thornless
Larix decidua	Larch, European
Morus alba	Mulberry, White
Pinus sylvestris*	Pine, Scots
Livingston	
Acer negundo	Box-elder
Quercus bicolor × prinus	Oak, ?

Table 5. Continued

Genus/species	*Common Name*
Quercus ×jackiana	Oak, Jack
Salix babylonica*	Willow, Weeping
Mackinac	
Betula alleghaniensis	Birch, Yellow
Sorbus decora*	Mountain-ash, Showy
Syringa vulgaris	Lilac
Macomb	
Asimina triloba	Pawpaw
Ilex opaca	Holly, American
Prunus nigra*	Plum, Canada
Salix exigua	Willow, Sandbar
Salix fragilis*	Willow, Crack
Staphylea trifolia*	Bladdernut, American
Manistee	
Acer pseudoplatanus	Maple, Sycamore
Acer saccharum	Maple, Sugar
Fagus grandifolia	Beech, American
Sequoiadendron giganteum	Sequoia, Giant
Marquette	
Acer pensylvanicum	Maple, Striped
Acer spicatum	Maple, Mountain
Betula alleghaniensis	Birch, Yellow
Picea glauca	Spruce, White
Pinus banksiana	Pine, Jack
Pinus strobus*	Pine, Eastern White
Pinus strobus*	Pine, Eastern White
Populus balsamifera*	Poplar, Balsam
Populus grandidentata*	Aspen, Bigtooth
Populus grandidentata	Aspen, Bigtooth
Monroe	
Sophora japonica	Pagoda-tree, Japanese
Muskegon	
Hamamelis virginiana	Witch-hazel
Oakland	
Acer saccharinum	Maple, Silver
Aralia spinosa	Devil's Walking Stick
Aronia prunifolia	Chokeberry
Carpinus caroliniana	Hornbeam, American or Bluebeech
Cephalanthus occidentalis	Buttonbush
Cornus alternifolia*	Dogwood, Alternate leaved
Cornus foemina var. racemosa*	Dogwood, Gray
Cornus purpusii	Dogwood, Silky
Corylus americana*	Hazelnut, American
Cotinus coggygria	Smoketree
Crataegus phaenopyrum	Hawthorn, Washington
Crataegus punctata	Hawthorn, Dotted
Elaeagnus angustifolia	Russian-Olive

Table 5. Continued

Genus/species	*Common Name*
Euonymus atropurpurea*	Burning Bush
Fagus sylvatica var. pendula	Beech, European Weeping
Malus ioënsis*	Crab, Prairie
Malus pumila	Apple, Common
Malus sylvestris	Apple, Crab
Nemopanthus mucronatus*	Holly, Mountain
Picea abies	Spruce, Norway
Prunus americana	Plum, Wild American
Quercus ×bebbiana	Oak, Bebb's
Quercus ellipsoidalis	Oak, Northern Pin
Quercus ×schuettii	Oak, Schuette
Rhamnus frangula*	Buckthorn, Glossy
Rhamnus frangula	Buckthorn, Glossy
Salix alba*	Willow, White
Salix alba var. vitellina*	Willow, Golden
Salix fragilis	Willow, Crack
Salix fragilis*	Willow, Crack
Salix serissima*	Willow, Autumn
Toxicodendron vernix	Sumac, Poison
Tsuga caroliniana	Hemlock, Carolina
Ulmus rubra	Elm, Slippery
Viburnum lentago*	Nannyberry
Viburnum opulus var. americanum*	Highbush-Cranberry
Viburnum prunifolium	Black Haw
Zanthoxylum americanum*	Prickly-Ash
Ontonagon	
Abies balsamea	Fir, Balsam
Populus tremuloides	Aspen, Quaking
Ottawa	
Morus rubra	Mulberry, Red
Ulmus pumila	Elm, Siberian
Ulmus rubra	Elm, Slippery
Schoolcraft	
Populus nigra var. italica	Poplar, Lombardy
Shiawassee	
Carya cordiformis	Hickory, Bitternut
Salix discolor	Willow, Pussy
St. Clair	
Acer rubrum*	Maple, Red
Ailanthus altissima	Tree-of-Heaven
Alnus rugosa*	Alder, Speckled
Quercus velutina*	Oak, Black
Salix amygdaloides	Willow, Peachleaf
St. Joseph	
Cornus florida	Dogwood, Flowering
Van Buren	
Gymnocladus dioicus	Coffee-tree, Kentucky

Table 5. Continued

Genus/species	*Common Name*
Washtenaw	
Acer ginnala	Maple, Amur
Acer griseum	Maple, Paperbark
Acer negundo*	Box-elder
Aesculus hippocastanum	Horse-Chestnut
Betula nigra	Birch, River
Carya laciniosa	Hickory, Shellbark
Cercidophyllum japonicum	Katsura Tree
Cercis canadensis	Redbud, Eastern
Cladrastis lutea	Yellow-wood
Ilex verticillata	Holly, Michigan
Juglans regia	Walnut, English
Juniperus communis*	Juniper, Common
Magnolia ×soulangiana	Magnolia, Saucer
Nyssa sylvatica	Tupelo, Black
Prunus serotina*	Cherry, Wild Black
Pseudotsuga menziesii	Douglas-Fir
Quercus muehlenbergii	Oak, Chinkapin
Rhamnus cathartica*	Buckthorn, European
Ulmus parvifolia	Elm, Chinese Lacebark
Ulmus procera	Elm, English
Wayne	
Alnus glutinosa	Alder, Black
Celtis occidentalis	Hackberry, Northern
Cornus foemina var. racemosa	Dogwood, Gray
Crataegus crus-galli	Cockspur Thorn
Crataegus mollis*	Hawthorn, Downy
Crataegus monogyra	Hawthorn, Oneseed or English
Crataegus sp.	Hawthorn
Euonymus europaea	Spindle tree
Gleditsia triacanthos*	Honey-Locust
Lindera benzoin	Spicebush
Liriodendron tulipifera	Tulip-tree
Malus angustifolia	Apple, Southern Crab
Malus coronaria	Apple, Sweet Crab
Populus deltoides	Cottonwood, Eastern
Prunus virginiana	Cherry, Choke
Pyrus communis	Pear, Common
Quercus bicolor	Oak, Swamp White
Quercus palustris	Oak, Pin
Ulmus serotina	Elm, September
Viburnum alnifolium	Viburnum, Hobble-bush
Viburnum opulus var. americanum*	Highbush-Cranberry
Viburnum opulus var. americanum*	Highbush-Cranberry
Wexford	
Ulmus americana*	Elm, American

NOTES

NOTES

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On the cover: *Paul Thompson with yellow birch* (Betula alleghaniensis) *in the Upper Peninsula.*

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THE

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VEGETATION AND FLORA OF PASSAGE ISLAND, ISLE ROYALE NATIONAL PARK, MICHIGAN

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The Lower Peninsula of Michigan, the Upper Peninsula, the main island of Isle Royale, and Passage Island represent a series of smaller but increasingly richer boreal biotic landscapes as measured by numbers of arctic-alpine plant species present. In contrast, this series shows a diminishing level of interaction between progressively more depauperate megafaunas and the plant communities with which they interact. On the Midwestern mainland, humans, moose, wolves, and deer all interact in a complex way, with humans playing a major role through hunting animals and logging numerous tree species. On Isle Royale proper, the players are numerous moose, a few wolves, and several tree species; humans are relegated to observers. And on Passage there is no megafauna and the plant community is dominated by a single tree species, balsam fir (*Abies balsamea*).

As part of a grant to conduct a vascular plant inventory and monitoring establishment program at Isle Royale National Park, I was able to pay two visits to Passage Island on 20-24 June and 15 August 1994. In addition to establishing nine monitoring plots (Judziewicz 1995), an attempt was made to voucher all vascular plants that occur on the island.

Passage Island contains the most concentrated assemblage of arctic-alpine plant species in the Midwestern United States (Crispin et al. 1985). Most prominent are the well-known large populations of devil's-club (*Oplopanax horridus*, Fig. 4), disjunct from the Pacific Northwest here, on the northeastern tip and offshore islands of Isle Royale proper (Wheeler 1901, Cebelak 1983), and on Porphyry and Dupuis Islands in nearby Ontario. Other prominent rare species are rock whitlow-grass (*Draba glabella*) and hoary whitlow-grass (*D. incana*) (Freudenstein & Marr 1986) and the first record of mountain-cranberry (*Vaccinium vitis-idaea*) from Michigan since 1868 (Voss 1996, Judziewicz 1995). In all, including two new rare species found in this study, there are 34 Michigan "listed" rare species on Passage Island compared with 64 on Isle Royale National Park as a whole and about 400 in all of Michigan.

Location and geology. Passage Island (parts of Sec. 3, 4, and 9, T67N R32W; 48°14′ N, 88°22′ W; Figs. 1-2, Tables 1-2) is located 5.5 km northeast of Blake Point, the northeasternmost tip of the main island of Isle Royale, and about 25 km southeast of Ontario's Black Bay Peninsula. A narrow, southwest-northeast trending island 2.7 km long and only 100-400 m wide, it has an area of about 75 ha (185 acres). The terrain is rocky, with two ridges composed of the Green-

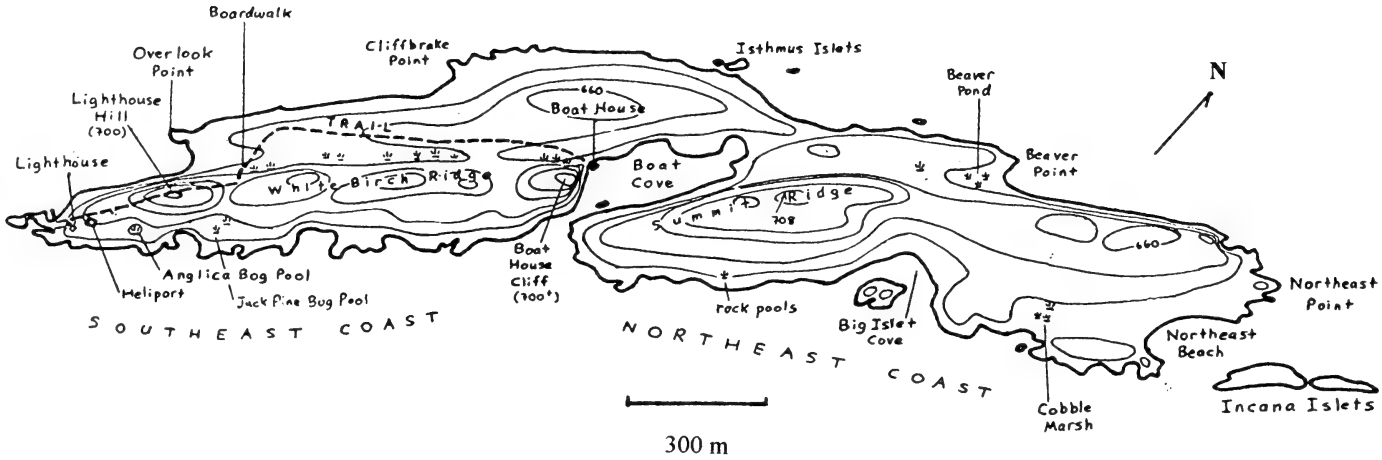

FIGURE 1. Topographic map of Passage Island, modified from U.S. Geological Survey Passage Island 7.5' topographic map using infra-red air photos taken on 26 August 1994. The place names used are informal (see Table 1).

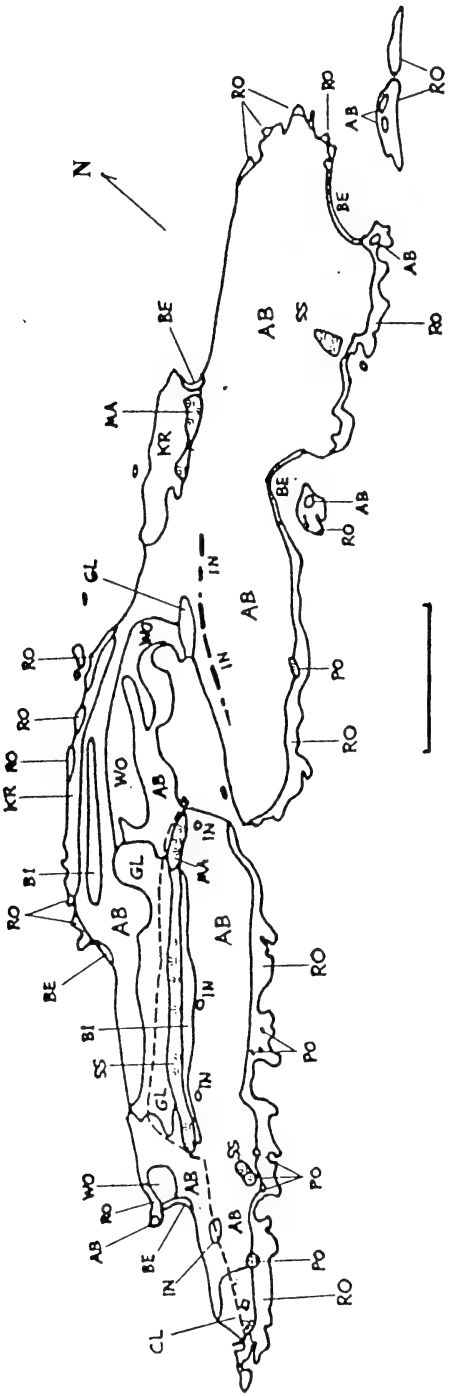

FIGURE 2. Plant communities of Passage Island, based on 1994 field work and infra-red air photos taken on 26 August 1994 (abbreviations given in Table 2).

TABLE 1. *Passage Island place names.* The following informal names of localities are listed from the southwestern tip of Passage Island to its northwestern tip. Refer to Fig. 1 for locations.

1 – Vicinity of lighthouse, heliport, and radio tower supports.
2 – Anglica Pool ca. 100 m northeast of lighthouse.
3 – Southeast Coast: rocky shoreline from lighthouse to entrance to Boat Cove.
4 – Lighthouse Hill: includes trail from lighthouse 500 m northeast to boardwalk.
5 – Overlook Point.
6 – Boardwalk across low point on trail.
7 – Trail Glades: these extend from 100 m northeast of boardwalk northeast almost to the Boat House; includes species found along the trail itself.
8 – White Birch Ridge.
9 – Jack Pine Point Bog: sphagnum bog just inland from rocky shoreline.
10 – Cliffbrake Point.
11 – Boat House Marsh.
12 – Boat House.
13 – Boat House Cliff.
14 – Boat Cove.
15 – Summit Ridge.
16 – Isthmus.
17 – Isthmus Islets.
18 – Southeast Coast: rocky shoreline from entrance to Boat Cove to northeast tip of island.
19 – Big Islet Cove.
20 – Beaver Pond Point and Cove.
21 – Cobble Marsh.
22 – Northeast Beach.
23 – Northeast Point.
24 – Incana Islets.

TABLE 2. Plant communities of Passage Island (refer to map in Fig. 2).

AB – Closed canopy boreal forest dominated by balsam fir (*Abies balsamea*).
BE – Cobble or gravel beach.
BI – White birch (*Betula papyrifera*) forest.
CL – Clearing (anthropogenic).
GL – Glade or successional meadow.
IN – Inland rock outcrop.
KR – Upland "krummholz" dominated by showy mountain-ash (*Sorbus decora*), red-osier dogwood (*Cornus stolonifera*), and tag alder (*Alnus incana*).
MA – Marsh or open marshy swamp.
PO – Rock or bog pool associated with rocky shoreline.
RO – Rocky shoreline of Lake Superior.
SS – Shrub swamp dominated by red-osier dogwood (*Cornus stolonifera*) and tag alder (*Alnus incana*).
WO – Open boreal "woodland" of balsam fir (*Abies balsamea*) and showy mountain-ash (*Sorbus decora*).

the Greenstone Lava Flow, which slopes gradually to the southeast-facing coast and abruptly to cliffs on the northwest coast, enclosing a central valley composed of softer sedimentary conglomerate. The southwestern 3/4 of the island is mapped as being composed of undifferentiated lava flows, possibly ophitic flood basalts, while the northeastern tip (beyond a line from Beaver Pond Cove to Cobble Marsh) is composed of lavas of the Greenstone Flow (Huber 1973).

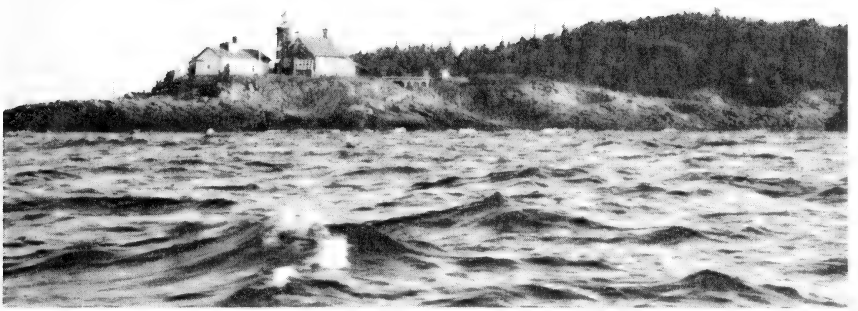

FIGURE 3. Passage Island lighthouse as viewed from the southeast, 16 Aug. 1994.

Human history. Passage Island has long been important for navigation purposes as the gateway to Thunder Bay. In 1882 a lighthouse, automated in 1978 and still maintained (Hyde 1986, Lenihan 1987), was built on the southern end. The lighthouse complex (Fig. 3) includes a fog signal building, a radio tower, several small outbuildings, and a recently constructed wooden heliport. A 1.2 km long trail is maintained from the lighthouse north to the Boat House on the southwest shore of the Boat Cove (Fig. 14). Today Passage Island is part of Isle Royale National Park, a Wilderness Area and International Biosphere Reserve, with day visits regulated and camping and overnight docking prohibited. During the summer the weekly National Park Concessions, Inc. boat *Sandy* brings day visitors to the Boat Cove for the hike to the lighthouse. The construction and maintenance of this trail has had important consequences on the vegetation of the southern part of the island, which has a glade or successional meadow several hectares in size paralleling the trail. Other past human effects on the island must have been significant, but are not well documented.

PLANT COMMUNITIES

Crispin et al. (1985) have presented a brief survey of the natural communities of Passage Island. The following summary elaborates on their descriptions; the communities are mapped in Fig. 2 and abbreviations are given in Table 2.

FIGURE 4. Gap in white birch-dominated ridge forest showing understory of devil's-club (*Oplopanax horridus*), spreading woodfern (*Dryopteris expansa*), and squashberry (*Viburnum edule*). 24 June 1994.

Boreal forest (AB). Balsam fir is by far the dominant tree on the island (e.g. Fig. 13), with white birch (*Betula papyrifera*) and showy mountain-ash (*Sorbus decora*) of only local importance and increasing only when windthrow removes the balsam fir canopy. By contrast, on the main island of Isle Royale (on Blake Point), white spruce (*Picea glauca*) is a forest co-dominant because balsam fir is preferentially browsed by the large moose population. It is difficult to travel through these boreal forests, even more so than on the brushiest "yew" islands in the Apostle Islands archipelago such as Devils, North Twin, and Raspberry (Judziewicz & Koch 1993). The highest point on Passage Island is only 33 m above Lake Superior, but sheer cliffs, jumbled boulders the size of cars, and dense balsam fir and Canada yew (*Taxus canadensis*) thickets make "bushwhacking" extremely difficult in most places. The island's most celebrated plant native, devil's-club (Fig. 4), is also a problem, but its noxiousness to hikers has been perhaps overstated. Crispin's (1989) "devilishly spiny stalks" towards which "one dares not reach out for a hand hold" is a typical description. Actually, when brushed against a bare forearm the soft weak prickles scratch about as much as an overgrown red raspberry (*Rubus idaeus*), and stands dense enough to impede hiking cover only a few percent of the island's area.

Beaches (BE). There are about five areas where small cobble or coarse gravel beaches have developed in small coves (Fig. 8). Few distinctive species occur

here; the dominants are fireweed (*Epilobium angustifolium*) and beach pea (*Lathyrus maritimus*).

White birch forest (BI). Crispin et al. (1985) have pointed out that old-growth balsam fir forest on relatively deep soil is best-developed in the northeastern part of the island. Farther south, on the northwest side of the White Birch Ridge (Figs. 4, 15), is a narrow strip (about 300 by 20 m) of deep, rich soil which has the most mesic plant community on the island—the Passage Island equivalent version of the mesic woods that are common in the southwestern part of the main island. Large white birch dominate the overstory, while a thick carpet of spreading woodfern (*Dryopteris expansa*, Fig. 15) forms the understory: here species such as red baneberry (*Actaea rubra*), the sedge *Carex leptonervia*, wood millet (*Milium effusum*), small-flowered pyrola (*Pyrola minor*), rosy twisted-stalk (*Streptopus roseus*), white mandarin (*S. amplexifolius*), and nodding trillium (*Trillium cernuum*) are present.

Clearing (CL). The cleared area at the lighthouse complex on the south tip of the island is now dominated by bluejoint (*Calamagrostis canadensis*), but also has a strange mixture of weeds (dandelions are common), relicts of cultivation (rhubarb, caraway, creeping bellflower), and rare natives such as twisted whitlow-grass (*Draba arabisans*), small-flowered woodrush (*Luzula parviflora*), and many grape-fern (*Botrychium*) species. Wet swales near the heliport have wool-grass (*Scirpus cyperinus*), a rush (*Juncus balticus*), and wild mint (*Mentha arvensis*).

Glade or successional meadow (GL). Embedded in the balsam fir matrix is a unique native open glade that comprises only about 7% of the island, but contains much of its plant diversity. Brown (1937), who visited in 1930, refers to this meadow as an "old burn," but the origin of this opening—whether caused by natural or human-caused fire, cutting for lumber or firewood, grazing, or a combination of these factors—is uncertain. Crispin et al. (1985) point out that this glade is a "successional meadow" composed mainly of native species and is thus one of the few plant communities in Michigan where natural succession is occurring from meadow to forest, although there are a few exotics such as hawkweed present at the margins of the trail. Tree invasion is proceeding slowly, based on a comparison of 1994 conditions with a 1961 air photograph.

Inland rock outcrops (IN). Near the summits of the ridges that form the backbone of the island are exposed and shaded rock cliffs (Fig. 14, left) that have species found nowhere else on the island, such as bristly sarsaparilla (*Aralia hispida*), pale corydalis (*Corydalis sempervirens*), rusty woodsia (*Woodsia ilvensis*), fragrant fern (*Dryopteris fragrans*), and slender cliffbrake (*Cryptogramma stelleri*).

"*Krummholz*" (KR). These are dense thickets of showy mountain-ash, green alder (*Alnus viridis*), red-osier dogwood (*Cornus stolonifera*), ninebark (*Physocarpus opulifolius*), squashberry (*Viburnum edule*), and alder-leaved buckthorn (*Rhamnus alnifolia*), and fallen, rotted birch and mountain-ash trunks on cliff tops on the northwest-facing coast.

Rocky shoreline of Lake Superior (RO) along with associated *Rock pools* (PO; Figs. 7 and 16). These communities are well-developed on the southeast-facing shore (Figs. 5, 11, 12, and cover) where storm waves have the longest

FIGURE 5. U-shaped coastal hollow near the lighthouse, with wild chives (*Allium schoenoprasum*) in the foreground. These hollows may be the result of either Pleistocene glacial scouring, or more recent ice scouring. 24 June 1994.

FIGURE 6. Close-up of wild chives (*Allium schoenoprasum*) near lighthouse. 24 June 1994.

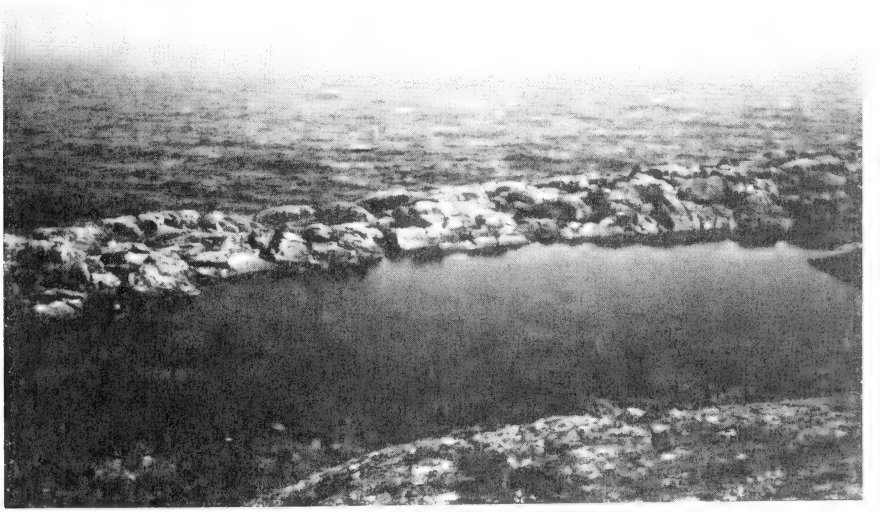

FIGURE 7. Large and floristically diverse rock pool ("Anglica Pool") about 100 m northeast of the lighthouse. Plants around the margin include common bog ericads, crowberry (*Empetrum nigrum*), bog bilberry (*Vaccinium uliginosum*), English sundew (*Drosera anglica*), the sedges *Carex castanea* and *Carex gynocrates*, and the grass *Muhlenbergia uniflora*.

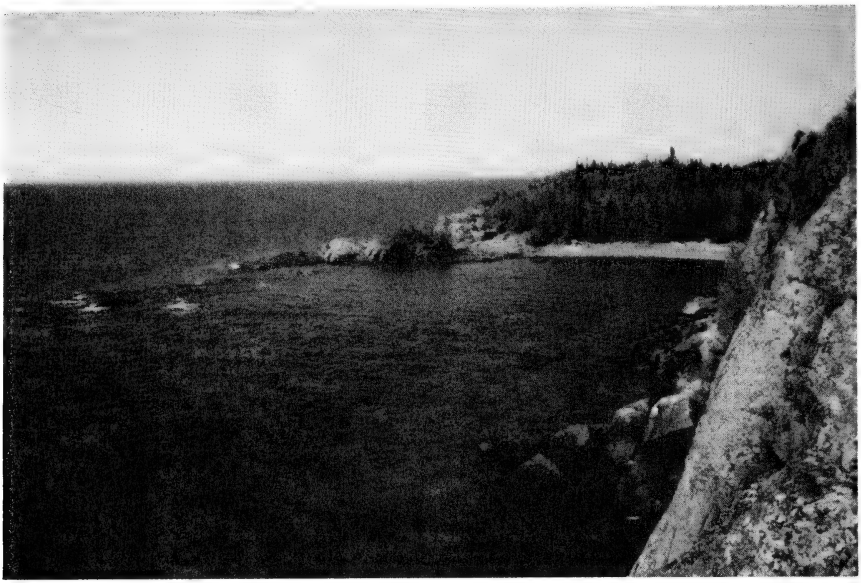

FIGURE 8. View northwest from Lighthouse Hill showing Overlook Point and cobble beach in cove, habitat of wild chives (*Allium schoenoprasum*), black crowberry (*Empetrum nigrum*), and encrusted saxifrage (*Saxifraga paniculata*). 23 June 1994.

uninterrupted fetch over Lake Superior. They form a narrow belt no more than 50-75 m wide and totalling no more than several hectares, but have the greatest concentration of rare plants on the island. Crispin et al. (1985) and Slavick & Janke (1993) have described three zones proceeding upslope from the water: splash, lichen-heath, and heath. The splash zone has a limited number of herbs, the commonest being harebell (*Campanula rotundifolia*) and yarrow (*Achillea millefolium*). Further up is a lichen-herb zone, with rough goldenrod (*Solidago hispida*), three-toothed cinquefoil (*Potentilla tridentata*), and tufted hairgrass (*Deschampsia cespitosa*). This type has the greatest diversity of herbs owing to the presence of rock pools and moist crevices. These pools are acid and boggy and often support a full complement of heaths present such as Labrador tea (*Ledum groenlandicum*), leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), bog laurel (*Kalmia polifolia*), and American cranberry (*Vaccinium oxycoccos*) as well as other woody species such as sweet gale (*Myrica gale*) and shrubby cinquefoil (*Potentilla fruticosa*). The best-developed example is the large Anglica Pool (Fig. 7) about 125 m from the lighthouse: many species not present elsewhere on the island are found here, including beaked bladderwort (*Utricularia cornuta*), a delicate species of muhly grass (*Muhlenbergia uniflora*), the sedges *Carex gynocrates* and *C. pauciflora*, and abundant English sundew (*Drosera anglica*). There are well-developed although smaller pools along the remainder of the southeast coast; the northeast

FIGURE 9. Habitat of small-flowered woodrush (*Luzula parviflora*) in boreal forest near the boardwalk. Note dominance of Canada yew (*Taxus canadensis*) in the understory. 21 June 1994.

coast has one pool complex about 350 m northeast of the entry to the Boat Cove, with water-celery (*Vallisneria americana*) present. Elsewhere, pools grade into rivulets that are dominated by dense clumps of *Scirpus cespitosus* with associates such as shrubby cinquefoil, bog bilberry (*Vaccinium uliginosum*), and the rare species northern spikemoss (*Selaginella selaginoides*) and both false asphodels (*Tofieldia glutinosa* and *T. pusilla*).

The uppermost rock shoreline community is the heath zone, which is dominated by bearberry (*Arctostaphylos uva-ursi*) and the junipers *Juniperus communis* and *J. horizontalis*, along with shrubby individuals of white cedar, green alder, balsam fir, and blueberries (*Vaccinium angustifolium* and *V. myrtilloides*). This zone is transitional to boreal forest.

Marshy swamp (MA). This is a tiny community, but extremely rich. Two areas with a total area of one hectare comprise this type:

1) The Boat House Marsh, extending southwest from the Boat House up the central valley (Fig. 14, center) and including auricled twayblade (*Listera auriculata*). Probably the human disturbance connected with the establishment of the "successional meadow" and more recent beaver activity are responsible for the great numbers of wetland and mesic plant species restricted to this area.

2) The Beaver Pond in the northeastern part of the island, which was not examined closely, and which appears to grade into the next community type.

Shrub swamp (SS). This community occurs in two places: extending from the trail boardwalk to the Boat House Marsh, where the dominants are red-osier

FIGURE 10. Small-flowered woodrush (*Luzula parviflora*) along path through boreal forest near the boardwalk about 0.5 km northeast of the Lighthouse. 21 June 1994.

dogwood and tag alder (*Alnus incana*); and at the "Cobble Marsh" near the northwest end of the island, where a unique (for the island) assemblage of species including flat-topped aster (*Aster umbellatus*), field-mint (*Mentha arvensis*), water-horehound (*Lycopus uniflorus*), red-stemmed gentian (*Gentiana rubricaulis*), Macoun's buttercup (*Ranunculus macounii*), marsh-marigold (*Caltha palustris*), bog goldenrod (*Solidago uliginosa*), manna grass (*Glyceria striata*), and the sedge *Carex utriculata* are present under an understory of red-osier dogwood and tag alder.

Boreal "woodland" (WO). Where disease has killed large numbers of balsam fir, an open woodland or savanna of trees develops with mountain-ash often becoming common. These stands often have dense stands of Canada yew, devil's-club, and squashberry (*Viburnum edule*) in the understory. This vegetation type is found mainly near the isthmus (Fig. 13, far right) and between the boardwalk and Overlook Point.

HISTORY OF BOTANICAL RESEARCH

Passage Island has been the recipient of numerous day-trips by botanists throughout the 20th century, beginning with Wheeler (1901), who discovered

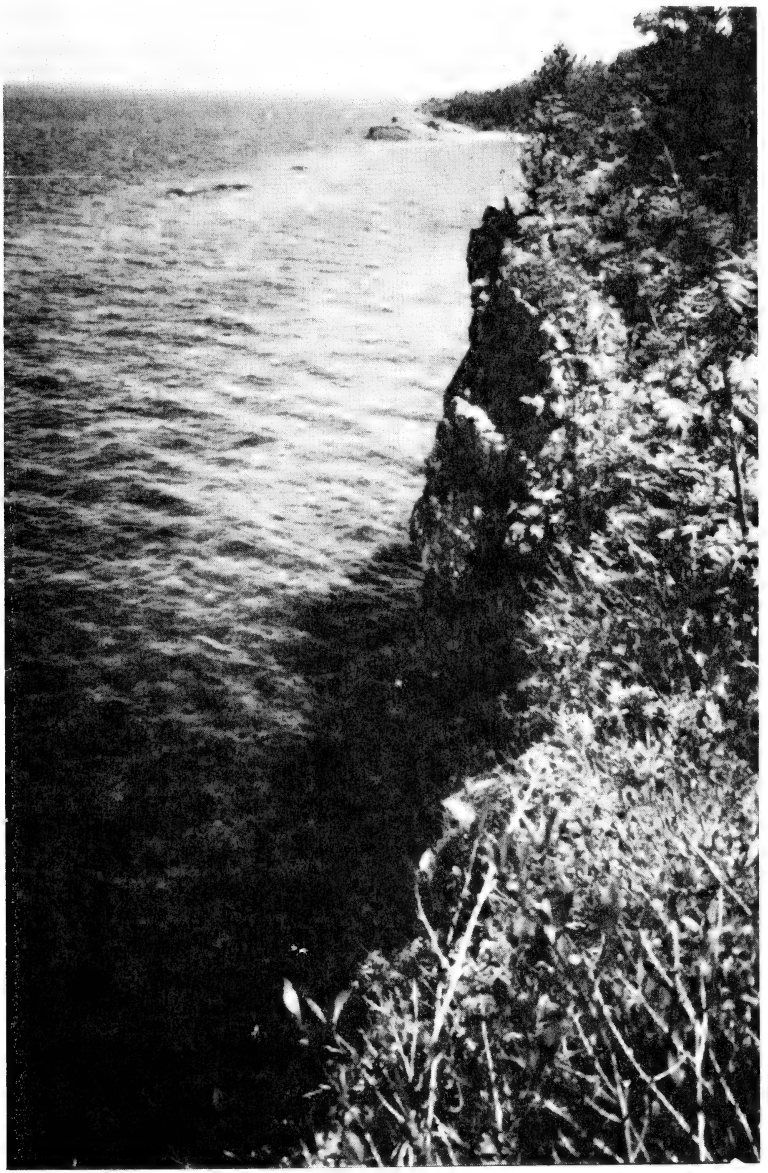

FIGURE 11. Looking northeast along 10 m high cliffs on the northwest-facing shore of the island, habitat of encrusted saxifrage (*Saxifraga paniculata*); Cliffbrake Point on the horizon. 23 June 1994.

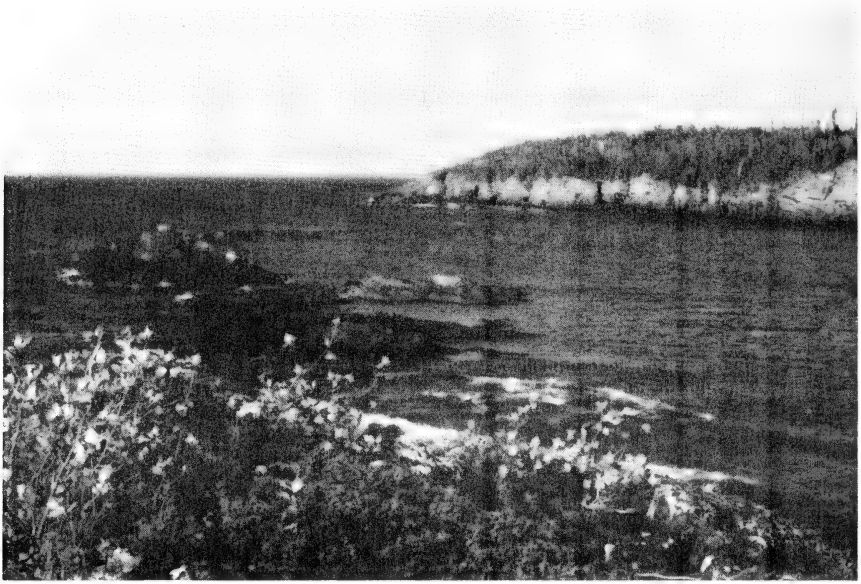

FIGURE 12. View northeast from Beaver Pond Point towards the north tip of Passage Island. Note sheer cliffs on this northwest-facing coast of the island. There is a thicket of balsam-poplar (*Populus balsamifera*) in the foreground, and the Gull Islands are visible on the horizon just to the left of the cliffs. 21 June 1994.

FIGURE 13. View northwest from Summit Ridge across isthmus, showing open balsam fir woodland. The sheltered shorelines here are the habitat of slough grass (*Beckmannia syzigachne*), noted here in 1984 by Crispin et al., 21 June 1994.

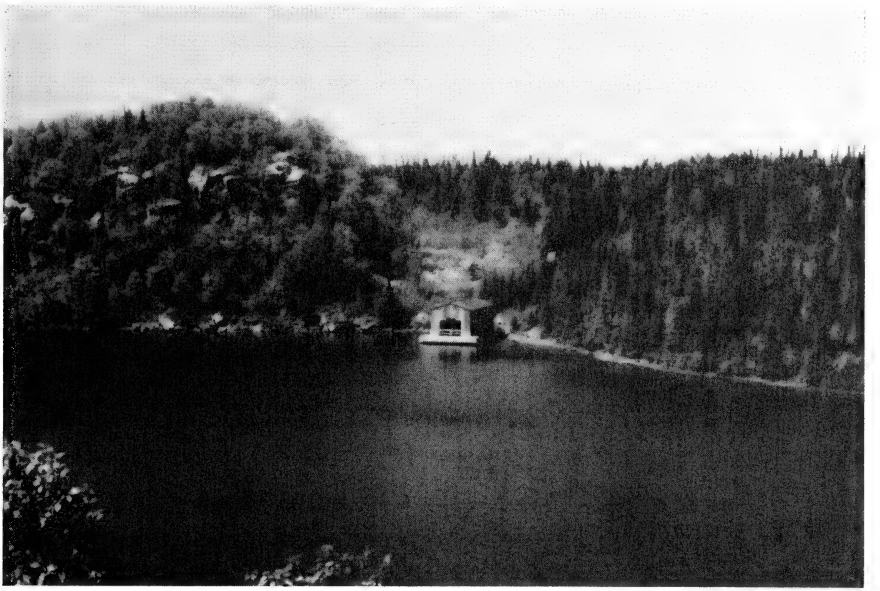

FIGURE 14. View southwest from Summit Ridge, showing Boat House Cliff (left, with forest of balsam fir and white birch), Boat House, Boat Cove Marsh behind it, and boreal forest dominated by balsam fir (right). 21 June 1994.

devil's-club here and on Blake Point in 1900. This exploration continues to the present; on the day I left the island, 24 June 1994, pteridologists Don and Joyce Drife arrived to discover several species of grape-ferns (*Botrychium*) that I and other botanists had overlooked along the sidewalk at the lighthouse! Other collectors have included William S. Cooper (1913, 1914) in 1909, Herma A. Baggley (7 September 1942 and 29 July 1945), Philip C. Shelton (11 July and 21 September 1962), Robert Janke (16 June 1962 and 25 June 1980), and Edward G. Voss (9 August 1975).

The most exhaustive botanical study to date was conducted in 1984-1985, when a Michigan Natural Features Inventory team including Susan Crispin, Janet Marr, John Freudenstein, and V. Dunevitz spent a total of two weeks in June and July camping on the island and inventorying rare plants and plant communities (Crispin et al. 1986), mostly on shorelines. They recorded 29 Michigan threatened and special concern species and completed standard inventory forms for 18 rare plant sites (Crispin et al. 1985). The most interesting finds of this very thorough survey were populations of the rare whitlow-grasses *Draba glabella* and *D. incana* (Freudenstein & Marr 1986).

In view of the island's unique role as a mooseless "control" in comparison with the main island, it is surprising that plant ecologists have neglected to study Passage Island's forests in detail.

Comparison of Passage Island with other Lake Superior islands of similar size

It is interesting to compare the flora of Passage Island with two southern counterparts, Devils and North Twin Islands in the Apostle Islands archipelago of northern Wisconsin, 170 km to the southwest (Judziewicz & Koch 1993). Passage and Devils are similar in their positions in their respective archipelagoes (farthest north and most remote, with the greatest concentration of arctic-alpine species), flora size (about 250 species each), and human use (both have lighthouse reservations). They differ somewhat in physical size (75 ha for Passage, 130 ha for Devils). The pair have 136 species in common, resulting in an index of similarity of 54%. Most interesting is the low number of arctic-alpine species present on Devils Island: only three of the 32 Michigan rare species present on Passage Island are found there.

Passage Island and remote, undisturbed North Twin Island (71 ha) are almost exactly the same size, but the latter has only 124 species, less than one-half that of Passage. The much greater diversity of Passage Island's flora compared with this Apostle Island is probably due to its combination of greater topographic diversity (higher, rockier, and with a longer coast line with a large sheltered cove), greater human disturbance (namely the high diversity of species found only in the Boat Cove Marsh and glades and around the lighthouse), and possibly the greater availability of nutrients in its basic basaltic and conglomeritic rocks.

Passage may also be compared with an Isle Royale offshore island in the Rock Harbor chain: Mott Island. Mott is slightly smaller (58 ha) and much less isolated than Passage and has a flora of almost exactly the same size. Mott's lead over Passage in exotic species (56 vs. 30) and bog and swamp species (due to the presence of these features in the interior of Mott Island) is counterbalanced by Passage's larger arctic-alpine species component. The pair have 164 species in common, resulting in an index of similarity of 65%.

It may be of interest to cite species that are common on the main island of Isle Royale but are not recorded on Passage Island: mountain maple (*Acer spicatum*), calypso orchid (*Calypso bulbosa*), pipsissewa (*Chimaphila umbellata*), cow-wheat (*Melampyrum lineare*), fringed polygala (*Polygala pauciflora*), bracken fern (*Pteridium aquilinium*), and early saxifrage (*Saxifraga virginiensis*).

CHECKLIST OF VASCULAR PLANTS.

Prior to these visits, Voss' notebooks, the Crispin et al. (1985) report and inventory forms, and the floras of Cooper (1914), Brown (1937), and Slavick & Janke (1993) were reviewed to compile a preliminary list of about 150 species reported (but not necessarily vouchered) from Passage Island. Visits of 20-24 June and 15 August 1994, and a brief visit on 4 June 1997, plus herbarium searches, increased that total to 271 species. Difficult groups such as the grasses, sedges, and rushes, as well as transient exotic species liable to disappear from the flora such as shepherd's-purse (*Capsella bursa-pastoris*) were vouchered. Some common species are incompletely vouchered.

Nomenclature follows Slavick & Janke (1993), which in turn follows Gleason & Cronquist (1991). An asterisk (*) preceding the species indicates that it is an exotic. T denotes "Threatened" and SC "Special Concern" status in Michigan. Collectors, all of whose collections are deposited at the University of Michigan Herbarium (MICH) unless noted, are abbreviated as follows: D & D = Don and Joyce Drife; J = Judziewicz; V = Edward G. Voss. Numerals indicate island localities following Fig. 2 and Table 1.

The list includes 27 alien species, 26 pteridophytes, 9 gymnosperms, 89 monocots, and 147 dicots for a total of 271 species for Passage Island.

PTERIDOPHYTES

ADIANTACEAE (Maiden-hair Fern Family)

Cryptogramma stelleri (S. Gmelin) Prantl, slender rock brake. SC. Rare, shaded crevice, 10. *Freudenstein 1729.*

ASPLENIACEAE (Spleenwort Family)

Athyrium filix-femina (L.) Roth, lady fern. Common, marshes and edges. *J 11133.*

Cystopteris fragilis (L.) Bernh, fragile fern. Common, shaded rocks. *J 11082.*

Dryopteris carthusiana (Villars) H.P. Fuchs, toothed wood fern. Rare, marsh, 11. *J 10902.*

Dryopteris expansa (Presl) Fraser-Jenkins & Jermy, spreading wood fern. Abundant, forests, particularly under white birch (Fig. 15).

FIGURE 15. Rich boreal forest dominated by white birch at a gap in White Birch Ridge. Note the dominance of spreading woodfern (*Dryopteris expansa*) in the understory. 20 June 1994.

FIGURE 16. Typical small southeast shore splash pools dominated by tussocks of *Scirpus cespitosus*. This is the typical habitat for northern spikemoss (*Selaginella selaginoides*), dwarf false asphodel (*Tofieldia pusilla*), fir clubmoss (*Lycopodium selago*), and butterwort (*Pinguicula vulgaris*). 21 June 1994.

Dryopteris fragrans (L.) Schott, fragrant fern. SC. Uncommon, shaded inland cliffs, 4, 8, 10, 13, 15. *Freudenstein & Marr 1739*; *V 14724*.

Gymnocarpium dryopteris (L.) Newm., oak fern. Occasional, woods. *J 11102*.

Thelypteris palustris Schott, marsh fern. Reported by Crispin et al. (1985), and from Boat Cove Marsh by Freudenstein & Marr, 5 July 1985; not seen in 1994 or 1997, and possibly based on a misidentification of *Athyrium filix-femina*.

Thelypteris phegopteris (L.) Slosson, beech fern. Occasional, woods. *J 11031*.

Woodsia ilvensis (L.) R. Br., rusty cliff fern. Common, exposed rocks. *J 11077*.

EQUISETACEAE (Horsetail Family)

Equisetum arvense L., field horsetail. Occasional, shorelines. *J 11067*.

Equisetum sp., probably *E. palustre* L., the marsh horsetail. Rare, beaver pond margin, 17.

LYCOPODIACEAE (Clubmoss Family)

Lycopodium annotinum L., bristly clubmoss. Common, woods. *J 10952*.

Lycopodium complanatum L., trailing ground-pine. Uncommon, 7. *J 10956*, *11043*.

Lycopodium dendroideum Michaux, ground-pine. Occasional, 7.

Lycopodium inundatum L., bog clubmoss. Reported from 2 by Crispin et al. (1985); not seen in 1994.

Lycopodium lucidulum Michaux, shining clubmoss. Common, woods.

Lycopodium selago L., fir clubmoss. SC. Uncommon, shorelines crevices, 3, 18. *Crispin 1037*.

OPHIOGLOSSACEAE (Adder's-tongue Fern Family)

Botrychium lunaria (L.) Sw., common moonwort. Local, grassy areas, 1, 7. Recorded by Brown (1937) from old burns and lichen mats. *D & D s.n.*.

Botrychium minganense Vict., Mingan moonwort. Rare, grassy area, 1; also "openings," *Freudenstein & Marr 1733*.

Botrychium multifidum (S. Gmelin) Rupr., leathery grape-fern. Rare, grassy area, 7. *V 14719*.

Botrychium simplex Hitchc., least moonwort. Rare, grassy area, 1; also near Boat Cove, *Freudenstein & Marr 1717*.

Botrychium virginianum (L.) Sw., rattlesnake fern. Fairly common, edges, especially near 7. *J 11019*.

OSMUNDACEAE (Flowering-fern Family)

Osmunda claytoniana L., interrupted fern. Local, 100 plants in sphagnous swamp, 9. *J 10954*.

POLYPODIACEAE (Polypody Family)

Polypodium virginianum L., rock polypody. Common, rocks.

SELAGINELLACEAE (Spikemoss Family)

Selaginella selaginoides (L.) Link, northern spike moss. Uncommon, usually in *Scirpus cespitosus* sods at the margins of rock pools, 3, 18. *Freudenstein & Marr 1740* at Boat Cove.

GYMNOSPERMS

CUPRESSACEAE (Cypress Family)

Juniperus communis L., common juniper. Common, rocks above splash zone.

Juniperus horizontalis Moench, creeping juniper. Common, rocks above splash zone.

Thuja occidentalis L., white cedar. Occasional; large trees along 3.

PINACEAE (Pine Family)

Abies balsamea (L.) Miller, balsam fir. By far the dominant tree.

Larix laricina (Duroi) K. Koch, tamarack. Rare as a sapling, 9. *J 10912*.

Picea glauca (Moench) Voss, white spruce. Rare as a sapling, 3. Reportedly a few large open-grown trees along the trail (Crispin et al. 1985). *J 11097*.

Picea mariana (Miller) BSP., black spruce. Rare as a sapling, 9, J sight record.

Pinus banksiana Lamb., jack pine. One tree on exposed rock, 9, J photographic record.

TAXACEAE (Yew Family)

Taxus canadensis Marshall, Canada yew. The dominant forest understory shrub (Fig. 9).

MONOCOTS

CYPERACEAE (Sedge Family)

Carex arctata Boott. Common, 7. *J 11038*.

Carex atratiformis Tuckermann. T. Occasional, 1, 3, 7, 18. *Shelton 254*.

Carex brunnescens (Pers.) Poiret. Occasional, 7. *Shelton 259*, *J 11089*.

Carex buxbaumii Wahlenb. Occasional, shores. *J 10938*.

Carex canescens L. Uncommon, 11. *J 10034*.

Carex capillaris L. Uncommon, shores. *Voss 14740*.

Carex castanea Wahlenb. Uncommon, margins of rock pools, 2, 10. *J 10903*.

Carex deflexa Hornem. Common, shaded mossy forest edges. *J 10927*, *10940*.

Carex deweyana Schwein. Common, 7; occasional elsewhere. *Shelton 273*, *J 11078*.

Carex disperma Dewey. Occasional, marshy and sphagnous areas. *J 10959*.

Carex eburnea Boott. Common, rocks on northwest-facing coast; occasional, other shores. *J 11130*.

Carex echinata L. Uncommon, bog pools north of lighthouse. *J 11140*.

Carex flava L. Occasional, wet shore crevices and along boat cove. *J 10945* (WIS), *11124*.
Carex foenea Willd. *Shelton 272* in 1961; *J 11091*.
Carex garberi Fern. Occasional, shores. *J 10905*.
Carex gynocrates Drejer. Rare, boggy rock pool shore, 2. *J 10924*, the first record from Isle Royale National Park.
Carex lenticularis Michaux. Occasional, rock shore crevices.
Carex leptalea Wahlenb. Rare, bog pool. *J 11141*.
Carex leptonervia Fern. Rare, marshy woods at 6. *J 10949*.
Carex limosa L. Locally common, boggy rock pool, 2. *J 10926* (WIS).
Carex norvegica Retz. (*C. media*). T. Fairly common, shorelines and trailsides. *Shelton 270*.
Carex oligosperma Michaux. Uncommon, boggy pool. *J 11056*.
Carex pauciflora Lightfoot. Rare, sphagnous pool, 9. *J 10928*.
Carex paupercula Michaux. Rare, sphagnous pool, 9. *J 10939*, *11135* (WIS).
Carex pedunculata Muhlenb. Uncommon, dry juniper thickets, 7. *J 10918*.
Carex scoparia Schk. Shores; first Isle Royale National Park record. *J 11076*.
Carex trisperma Dewey. Common, boggy and marshy spots. *Shelton 260*.
Carex umbellata Willd. Occasional, dry crevices, 3, 18. *J 10930* (WIS), *10942*.
Carex vesicaria L. Occasional, rock pools, as at 21. *J 11049*, *11122*.
Eleocharis smallii Britton, spikerush. Shores and rock pools; sight record by Voss in 1975.
Eriophorum angustifolium Honck. Rare, sphagnous pool margin NE of Boat Cove, in boggy shore pool; a new Isle Royale record. *J 10953*, *11139*.
Eriophorum tenellum Nutt. Reported by Brown (1937) from rock pools; not seen in 1994.
Eriophorum vaginatum L. Occasional, sphagnous pool margins, 2, 9, and elsewhere.
Eriophorum sp. Bog pools near 2. *J 11054*.
Scirpus cespitosus L. Common, rock pool margins. *Shelton 258*.
Scirpus cyperinus (L.) Kunth, woolgrass. Occasional, 1. *J 11098*.

IRIDACEAE (Iris Family)

Iris versicolor L., blue flag. Locally common, marshy areas such as 11. *J 11116*.
Sisyrinchium montanum Greene, blue-eyed grass. Occasional, rock shorelines, trailside, 1, 2, 7. *J 10909*, *11062*.

JUNCACEAE (Rush Family)

Juncus alpinoarticulatus Chaix. Occasional, rock pools, sight record by Voss in 1975.
Juncus balticus Willd. Local, swales at 1. *J 10955* (WIS).
Juncus brevicaudatus (Engelm.) Fern. Occasional, rock pools. *J 11138*.
Juncus tenuis Willd., path rush. Uncommon, trailside, 4. *J 11037*.
Luzula parviflora (Ehrh.) Desv., small-flowered woodrush (Figs. 9-10). T. Occasional, glades, open marshy and shaded boggy swales, trailsides, and shaded mossy boulders, 1, 6, 7, 8. *Crispin 927*.

LILIACEAE (Lily Family)

Allium schoenoprasum L., wild chives (Figs. 5-6). T. Occasional, moist shoreline rock crevices, usually on or near points. *Marr 1105*, *Voss 14722*.
Clintonia borealis (Ait.) Raf., bluebead lily. Abundant, woods.
**Lilium lancifolium* Thunb., tiger-lily. Relict of cultivation near tramhouse, J sight record.
Lilium philadelphicum L., wood lily. Occasional, rock shorelines, 3, 18. *J 11033*.
Maianthemum canadense Desf., wild lily-of-the-valley. Abundant, woods.
Streptopus amplexifolius (L.) DC., white mandarin. Occasional, marshy swales, rich woods, 1, 6, 8, 11. *J 11030*.
Streptopus roseus Michaux, rosy twisted-stalk. Common, woods. *J 11080*.
Tofieldia glutinosa (Michaux) Pers., false asphodel. Uncommon, rocky shoreline pools, usually in *Scirpus cespitosus* clumps, 3, 18. *Janke s.n.*, 25 June 1980.
Tofieldia pusilla (Michaux) Pers. T. Locally common, rocky shoreline pools, usually in *Scirpus cespitosus* clumps, 3, 18. *Marr 1099*, *V 14727*.
Trillium cernuum L., nodding trillium. Locally common, marshy swales, white birch stands, and trailsides, even in northeast half of island, 6, 7, 8, 11, 16. *J 10946* (WIS).

ORCHIDACEAE (Orchid Family)

Corallorhiza trifida Chatel., early coral-root. Uncommon, trailside, 7. *J 10951* (WIS).

Habenaria hyperborea (L.) R. Br., tall northern rein orchid. Uncommon, swales near 7. *J 11028* (WIS).

Habenaria obtusata (Pursh) Richardson, blunt-leaf orchid. Rare, balsam fir stand near 12. *V 14733*.

Habenaria psycodes (L.) Sprengel, purple fringed orchid. Rare, shoreline crevices. *J 11044*.

Habenaria viridis (L.) R. Br., bracted orchid. Locally common, 7. *J 10950*.

Listera auriculata Wieg., auricled twayblade. SC. Rare, 11; also a report (Crispin et al. 1985) from 21. *J 11028*.

Listera cordata (L.) R. Br., heart-leaved twayblade. Rare, sphagnous balsam fir swamp, 9. *J 10941* (WIS).

Spiranthes romanzoffiana Cham., stout ladies'-tresses. Rare, shoreline crevice. *J 11053*.

POACEAE (Grass Family)

Agrostis gigantea Roth, redtop. Near 1. *J 11069*.

Agrostis hyemalis (Walter) BSP, ticklegrass. Occasional, rock shorelines. *J 11110*.

Beckmannia syzigachne (Steudel) Fern., slough grass. T. Rare, mapped as occurring at two places on the shore of the Boat Cove (Fig. 13) by Crispin et al. (1985; voucher: *Crispin 1037*, MICH); not seen in 1994. The only other Isle Royale collection (and one of only three Michigan sites) was made in 1930 at McCargoe Cove by Brown, who noted (1937) that the species occurs "where fishermen beach their boats for the winter." This brings into question the status of the species as native on Isle Royale and suggests the possibility that currents blew the disseminules into the boat cove from the Thunder Bay area, where the species is common and weedy based on specimens in the LKHD herbarium.

Calamagrostis canadensis (Michaux) P. Beauv., blue-joint. Abundant, 1, 7, 11; fairly common, 3, 18, and elsewhere. *J 11052*.

Calamagrostis stricta (Timm) Koeler. SC. *J 10925*, *J 11136*. Occasional, rocky shorelines.

Cinna latifolia (Trevir) Griseb., wood-reed. Occasional, balsam fir forest near 12. *J 11032*.

Danthonia spicata (L.) P. Beauv., oatgrass. Common, dry rocks above splash zone. *J 11045*, *11095*.

Deschampsia cespitosa (L.) P. Beauv., tufted hairgrass. Common, trailsides and rock shore crevices. *J 11115*, *11125*.

Deschampsia flexuosa (L.) Trin., common hairgrass. Uncommon, moist crevices. *J 11015*.

Elymus trachycaulus (Link) Malte, wheatgrass. Uncommon, dry shoreline rocks. *J 11070*.

Festuca brachyphylla Schultes. Fairly common, rocky shorelines, 3, 18.

Festuca saximontana Rydb. *Janke s.n.*, 25 June 1980; *V 14735*.

Glyceria striata (Lam.) A. Hitchc., manna grass. Uncommon, 21. *J 11118*.

Hierochloe odorata (L.) P. Beauv., holy or sweet grass. Local, "sandy shore of cove along forest edge on NE part of island," 3 July 1985, *Freudenstein & Marr 1724*. Not noted in 1994.

**Hordeum jubatum* L., squirrel-tail grass. A rare weed (Cooper 1914, Brown 1937); not seen in 1994 and probably extirpated from the island.

Milium effusum L., wood millet. Uncommon, rich birch woods, 6, 8. *J 10957* (WIS).

Muhlenbergia uniflora (Muhlenb.) Fern. Rare, boggy pool, 2, apparently the only Isle Royale location; first collected in 1930 (*McFarlin 2450*). *J 10929* (WIS).

Oryzopsis asperifolia Michaux, rice-grass. Occasional, 7, *J s.n.*, 4 June 1997. Perhaps the source of the unvouchered report of the following species.

Oryzopsis pungens (Torrey) A. Hitchc. Reported in Freudenstein & Marr field notes as common at 7; not noted in 1994 or 1997.

**Phalaris arundinacea* L. Uncommon, swampy shore near north tip. *J 11131*.

**Phleum pratense* L., timothy. Locally common, 1, 7. *J 11064*.

Poa alpina L., alpine bluegrass. T. Common in trodden part of trail (7); uncommon, 1, 3, 18.

**Poa annua* L., annual bluegrass. Occasional, trodden part of trail, 7. *J 11081*.

**Poa compressa* L., Canada bluegrass. Common, 1, 7. *J 11104*, *11063*.

Poa glauca Vahl. Occasional, rocky shorelines. *J 11104*.

Poa palustris L., fowl meadow grass. Occasional, wet crevices and swamps. *J 11018*.

Trisetum spicatum (L.) Richter. SC. Common, rocky shorelines, trailsides, disturbed areas. *Voss 14734*.

SPARGANIACEAE (Bur-reed Family)

Sparganium cf. *angustifolium* Michaux, bur-reed. Local, rock pool on Northeast Coast, *J 11134* (WIS).

DICOTS

APIACEAE (Parsley Family)

**Carum carvi* L., caraway. Uncommon relict of cultivation, 1. *J 10943*.

Heracleum lanatum Michaux, cow-parsnip. Common, forest margins, particularly near 7. *J 11027*.

ARALIACEAE (Ginseng Family)

Aralia hispida Vent., bristly sarsaparilla. Uncommon, bluff top rocks, 4, 13, 15. *J 10913* (WIS).

Aralia nudicaulis L., wild sarsaparilla. Abundant, forests.

Oplopanax horridus (J.E. Smith) Miquel, devil's-club (Fig. 4). T. Abundant, forests, particularly in moist valleys and gorges, especially in balsam fir windthrows dominated by scattered mountain-ash; uncommon in mature balsam fir forests.

ASTERACEAE (Aster Family)

Achillea millefolium L., (incl. *A. lanulosa*), yarrow. Common, open areas, 1, 3, 7, 18.

Anaphalis margaritacea (L.) Benth. & Hook., pearly everlasting. Fairly common, open areas, 3, 7, 18. *J 11108*.

Antennaria neglecta Greene, pussy-toes. Common, open areas, 1, 3, 7, 18. *J 10937, J 11099*.

Artemisia campestris L., wormwood. Occasional, shoreline rock crevices, particularly on the northwest-facing coast, 1, 10, 17, 20. *Voss 14737, J 11106*.

Aster ciliolatus Lindley. Local, trailside glade, 7. *J 10901* (WIS), *11096*.

Aster macrophyllus L. large-leaved aster. Occasional, balsam fir forest, mostly along 7.

Aster umbellatus Miller, flat-topped aster. Rare, marsh, 21. *J 11127*.

**Chrysanthemum leucanthemum* L., ox-eye daisy. Occasional weed, 1, 7, 12. *J 11025*.

**Cirsium arvense* (L.) Scop., Canada thistle. Uncommon weed, 12.

Erigeron acris L., acrid fleabane. "Clearing," *Brown 3658*, 25 August 1930; not relocated in 1994 or 1997. This is nearly an Isle Royale record (Foote collected this species from an unspecified location in 1868) and one of only three known in Michigan (the other is from the Calumet Waterworks in the Keweenaw Peninsula, collected by *Hermann 797* in 1926). This species is frequent in the Thunder Bay area.

**Hieracium aurantiacum* L., orange hawkweed. Locally common, trail, 7, J sight record in 1994.

Hieracium kalmii L., Canada hawkweed. Occasional, trailside and rock shoreline. *J 11132*.

**Hieracium piloselloides* Villars, king devil hawkweed. Common, trail, 7. *J 11086*.

Hieracium umbellatum L. Local in glade, 7, *J 11092*.

Petasites frigidus (L.) Fries, sweet coltsfoot. Uncommon, balsam fir forest, 14, 16.

Prenanthes racemosa Michaux, white-lettuce. Occasional, rock shoreline crevices, 3, 18.

Senecio indecorus Greene. T. Uncommon, open areas, 7. *Crispin 1035*.

Solidago hispida Muhlenb., rough goldenrod. Fairly common, dry rocky shorelines, 3, 18. *J 11048*.

Solidago uliginosa Nutt., bog goldenrod. Fairly common, wet swales and marshes, 1, 11, 21. *J 11104*.

**Taraxacum officinale* Weber, dandelion. Common, open areas, 1, 7.

BALSAMINACEAE (Touch-me-not Family)

Impatiens capensis Meerb., spotted jewelweed. Rare, shoreline, 12. *J 11022* (WIS).

BETULACEAE (Birch Family)

Alnus incana (L.) Moench, speckled alder. Locally common, forming thickets between 8 and 11, *J 10958*.

Alnus viridis (Villars) Lam., green alder. Locally dominant in swales, particularly near northwest-facing coast.

Betula papyrifera Marshall, white birch. Common tree; best-developed at 8.

BORAGINACEAE (Borage Family)

Cynoglossum boreale Fern., northern comfrey. Occasional along 7. *J 10920*.

BRASSICACEAE (Mustard Family)

Arabis lyrata L., rock cress. Occasional, rock shoreline crevices. *J 11107*.

Barbarea orthoceras Ledeb., winter cress. SC. Rare, marsh, 11. *J 11117*.

**Capsella bursa-pastoris* (L.) Medicus, shepherd's purse. Rare, doorstep of lighthouse, *Janke s.n.*, 16 July 1960. *J 10944* (WIS).

Draba arabisans Michaux, twisted whitlow-grass. T. Common, 1; occasional, rocky shorelines, inland cliffs, 7. *Shelton 255*, *V 14717*.

Draba glabella Pursh, rock whitlow-grass. T. Rare, 20 plants in balsam fir forest/rock shoreline ecotone near lighthouse (Freudenstein & Marr 1986; voucher: *Freudenstein 1682*, MICH); 200 plants relocated on 4 June 1997. This is the only known location in the Lake Superior region.

Draba incana L., hoary whitlow-grass. T. Rare, eight plants noted on rock shoreline at the north end of island, 23 (*Brown 3671-B*, 25 August 1930; *Voss 14716*, GH, LKHD, MICH, MSC); also recorded from the islets off the north tip (24), where 300 plants were noted by Freudenstein & Marr (Crispin et al. 1985).

**Erysimum cheiranthoides* L., wormseed-mustard. Rare weed (*Janke s.n.*, 14 July 1962); *J 11066* (WIS), barely persisting.

**Erysimum inconspicuum* (S. Wats.) MacMillan. Rare weed (*Janke s.n.*, 15 July 1962), perhaps now extirpated.

**Lepidium densiflorum* Schrader. Rare weed (*Janke s.n.*, 16 June 1962). *J 11073* (WIS), barely persisting.

CAMPANULACEAE (Blue Bell Family)

Campanula rotundifolia L., harebell. Common, rock shorelines.

**Campanula rapunculoides* L., creeping bellflower. A locally pernicious weed at 6; also a few at 1; presumably a relict of cultivation (*Deanna Dawson s.n.* in 1973, IRP).

Lobelia kalmii L., brook lobelia. Uncommon, rock shorelines. *J 11138* (WIS).

CAPRIFOLIACEAE (Honeysuckle Family)

Diervilla lonicera Miller, bush-honeysuckle. Fairly common, 7. *J 11021*.

Linnaea borealis L., twinflower. Common, forests.

Lonicera dioica L., red honeysuckle. Occasional, 7. *J 11094*.

Sambucus racemosa L., red elder. Fairly common, forests.

Viburnum edule (Michaux) Raf., squashberry. T. Common and locally dominant in forests.

CARYOPHYLLACEAE (Pink Family)

**Cerastium vulgatum* L., mouse-ear chickweed. Fairly common weed, 1, 7. *J 10908* (WIS), *10931*, *11014* (WIS).

**Dianthus barbatus* L., sweet william. Along boardwalk and spreading into successional meadow and swamp up to 150 m to the northeast, *J 11084*.

**Dianthus deltoides* L., maiden pink. Rare weed along trail about 500 m from boathouse. *J 10921* (WIS), *11040*.

Sagina nodosa (L.) Fenzl, pearlwort. T. Occasional, rock shorelines near lake level in protected coves. *V 14739*, *J 11103*.

Stellaria borealis Bigelow, stitchwort. Common, 7; occasional, mature balsam fir forests. *V 14715*, *J 11035*, *11109*.

CORNACEAE (Dogwood Family)

Cornus canadensis L., bunchberry. Abundant, forests. *J 11041.*

Cornus stolonifera Michaux, red-osier dogwood. Common, often co-dominant with *Alnus* spp. in swales near northwest-facing coast and at 6 and 11. *J 11079.*

DROSERACEAE (Sundew Family)

Drosera anglica Hudson, English sundew. SC. Locally common in 1994, bog pool at 2 (Fig. 7). *Brown 3668*; *Janke s.n.*, 25 June 1980.

Drosera rotundifolia L., round-leaved sundew. Occasional, rock pools, often in *Scirpus cespitosus* sod, 3, 18. *J 11050* (WIS).

ELAEAGNACEAE (Oleaster Family)

Shepherdia canadensis (L.) Nutt., buffalo-berry. Uncommon, rocky shorelines in north, 13, 20. *J 11105.*

EMPETRACEAE (Crowberry Family)

Empetrum nigrum L., black crowberry. T. Locally common, rocky shorelines, particularly on headlands. *V 14723.*

ERICACEAE (Heath Family)

Andromeda glaucophylla Link, bog rosemary. Common, rock shoreline crevices and pools, 3, 18. *J 11143.*

Arctostaphylos uva-ursi (L.) Spreng., bearberry. Common, glades, rock shorelines, and cliffs.

Chamaedaphne calyculata (L.) Moench, leatherleaf. Fairly common, rock shoreline crevices and bog pools, 3, 18. *J 11142.*

Gaultheria hispidula (L.) Muhlenb., creeping snowberry. Uncommon, sphagnous pool, 9.

Kalmia polifolia L., bog laurel. Fairly common, rock shoreline crevices and bog pools, 3, 18.

Ledum groenlandicum Oeder, Labrador tea. Common, rock shoreline crevices and pools, 3, 18.

Vaccinium angustifolium Ait., early blueberry. Occasional, dry rocky shorelines. *J 11046.*

Vaccinium myrtilloides Michaux, velvet-leaved blueberry. Fairly common, rocky shorelines and sphagnous areas.

Vaccinium oxycoccos L., small cranberry. Occasional, sphagnous rocky shoreline pools, 3, 18. *J 11057.*

Vaccinium uliginosum L., alpine bilberry. T. Fairly common, exposed rocky shorelines, particularly near points. *Marr 1100, V 14736.*

Vaccinium vitis-idaea L., mountain-cranberry. T. sphagnous rocky shoreline sod, 3, 20 June 1994 and 4 June 1997; the first Michigan record since 1868 (Voss 1996). *J 10932.*

FABACEAE (Pulse Family)

Lathyrus maritimus (L.) Bigelow, beach-pea. Grassy areas and beaches, 1, 5, 10, 22. *V 14718, J 11075.*

**Trifolium repens* L., white clover. Occasional weed, 1, 7. *V 11068.*

FUMARIACEAE (Fumitory Family)

Corydalis sempervirens (L.) Pers., pale corydalis. Rare, rock cliff, 13; J sight record in 1994.

GENTIANACEAE (Gentian Family)

Gentiana rubricaulis Schwein., red-stemmed gentian. Occasional, sheltered coves, 11, 14, 21. *V 14720, J 11115* (WIS).

Halenia deflexa (J.E. Smith) Griseb., spurred-gentian. Occasional, trailsides and forest edges. *J 11012.*

GROSSULARIACEAE (Gooseberry Family)

Ribes glandulosum Grauer, skunk currant. Common, forests.

Ribes oxyacanthoides L. SC. Uncommon, only on steep bluffs at 1. *J 11072.*

Ribes triste Pallas, swamp currant. Occasional, trailside and forests.

LAMIACEAE (Mint Family)

**Galeopsis tetrahit* L., hemp-nettle. Rare shoreline weed at entrance to boat cove. *J 11100.*

**Glechoma hederacea* L., gill-over-the-ground. Rare weed or relict of cultivation (*Baggley s.n.*, 29 July 1945), not seen in 1994.

Lycopus americanus Muhlenb. Rare, sheltered shore, 14. *J 11101.*

Lycopus uniflorus Michaux, water-horehound. Uncommon, sheltered shore, 12, 14, 21. *J 11119.*

Mentha arvensis L., wild-mint. Uncommon, marshy swales, 1, 21. *J 11126.*

**Satureja vulgaris* (L.) Fritsch, wild basil. Rare, trailside, 7. *J 11090.*

LENTIBULARIACEAE (Bladderwort Family)

Pinguicula vulgaris L., butterwort. SC. Fairly common, wet shoreline crevices and sheltered coves.

Utricularia cornuta Michaux, horned bladderwort. Reported by Brown (1937) from "margin of beach pool" at 2. *J 11058* (WIS).

MENYANTHACEAE (Buckbean Family)

Menyanthes trifoliata L., buckbean. Locally common at a few pools such as 2, 9, 21. J sight records.

MONOTROPACEAE (Indian Pipe Family)

Monotropa uniflora L., Indian-pipes. Rare, woods. *J 10934.*

MYRICACEAE (Wax-Myrtle Family)

Myrica gale L., sweet gale. Occasional, rock pools, especially boggy sphagnous ones. *J 11060.*

ONAGRACEAE (Evening Primrose Family)

Circaea alpina L., enchanter's-nightshade. Uncommon, marsh and balsam fir forest, 11, 12. *J 10910* (WIS).

Epilobium angustifolium L., fireweed. Fairly common, disturbed areas, 1, 7. *J 11065.*

Epilobium ciliatum Raf., willow-herb. Occasional, marshy swales, 1, 11. *J 11023.*

Oenothera sp., evening-primrose. Reported in Crispin et al. (1985) by Marr & Dunevitz for 5 July 1985 from 7. Not noted in 1994.

PLANTAGINACEAE (Plantain Family)

**Plantago major* L., plantain. Common trailside weed.

POLYGONACEAE (Buckwheat Family)

Polygonum viviparum L. alpine bistort. T. Local, moist, shaded, mossy banks and shores, 14. *Shelton 253, V 14730.*

**Rheum rhabarbicum* L., rhubarb. Relict of cultivation at 1; four clumps noted in 1994 and 1997.

**Rumex acetosella* L., sheep sorrel. Uncommon trail weed, 4. *J 11016.*

PRIMULACEAE (Primrose Family)

Lysimachia terrestris (L.) BSP., yellow loosestrife. Rare, swamp near north tip. *J 11121* (WIS).

Primula mistassinica Michaux, arctic primrose. Common, shorelines. *J 14738.*

Trientalis borealis Raf., starflower. Occasional, forests.

PYROLACEAE (Wintergreen Family)

Moneses uniflora (L.) A. Gray, one-flowered pyrola. Occasional, forests, 12, 16, and northern part of island. *J 10947* (WIS).

Pyrola minor L. Rare, in rich mesic birch woods, 8. *J 10911* (WIS).
Pyrola secunda L., one-sided pyrola. Fairly common, young balsam fir woods near 7.

RANUNCULACEAE (Crowfoot Family)
**Aconitum napellus* L., garden monk's-hood. Relict of cultivation; about 100 plants at trail boardwalk, 6; known here since at least 1983. *J 11083.*
Actaea rubra (Ait.) Willd., red baneberry. Fairly common, forests. *J 11026.*
Anemone multifida Poiret, red anemone. Rare, rock crevices, 17. *V 14729.*
Anemone virginiana L., Virginia anemone. Rare, boat house shore. *J 11036.*
Aquilegia canadensis L., columbine. Rare, near tramhouse, possibly a relict of cultivation. *J 10914* (WIS).
Caltha palustris L., marsh-marigold. Locally common, marshy areas, 11 and elsewhere such as swamp near north tip, 21. *J 11123* (WIS).
Coptis trifolia (L.) Salisb., goldthread. Common, forests. *J 11087.*
Ranunculus abortivus L., kidney-leaved buttercup. Uncommon, marshy area, 11. *J 11088* (WIS).
**Ranunculus acris* L., common buttercup. Occasional weed, 1, 11, 12. *J 11013.*
Ranunculus macounii Britton. T. Occasional, marshy areas and shore, 12, 14, 21. *V 14726, J 11120.*
Thalictrum dasycarpum Fisch. & Ave-Lall., purple meadow-rue. Locally common, marshy area, 11. *J 11129.*

RHAMNACEAE (Buckthorn Family)
Rhamnus alnifolia L'Her., alder-leaved buckthorn. Common shrub of glades, marshes, balsam fir forests, and shorelines. *J 11144* (WIS).

ROSACEAE (Rose Family)
Amelanchier bartramiana (Tausch) M.J. Roemer. Occasional, forests and shorelines. *V 14725.*
Amelanchier sanguinea (Pursh) DC., juneberry. Common in various habitats. *J 11093.*
Fragaria vesca L., wood strawberry. Locally common, tramway steps, 1. *J 10917.*
Fragaria virginiana Duchesne, common strawberry. Fairly common, open areas and shorelines. *J 11017.*
Physocarpus opulifolius (L.) Maxim., ninebark. Locally dominant, wet shoreline crevices and sheltered shorelines, as at 14.
Potentilla anserina L., silverweed. Occasional, shorelines of protected coves. *Shelton 252.*
Potentilla fruticosa L., shrubby cinquefoil. Abundant, rocky shorelines. *J 11111.*
**Potentilla norvegica* L. Occasional weed, 1, 7, 12. *J 11128.*
Potentilla tridentata Sol., three-toothed cinquefoil. Abundant, rocky shorelines and inland cliffs. *J 11047.*
Prunus pensylvanica L.f., pin cherry. Common small tree throughout. *J 11059.*
Prunus virginiana L., choke cherry. A possible population in marsh at 11. *J 10900.*
Rosa acicularis Lindley, rose. Common, rocky and brushy areas.
Rubus idaeus L., red raspberry. Common, rocky and brushy areas.
Rubus parviflorus Nutt., thimbleberry. Reported as "occasional in open areas at woods edge," 5 July 1985, *Freudenstein & Marr 1743.* Not seen, 1994.
Rubus pubescens Raf., dwarf raspberry. Occasional, marshy areas, 11. *J 10922* (WIS).
Sorbus americana Marshall, American mountain-ash. Uncommon small tree, 16. *J 10919*, the first record for Isle Royale National Park.
Sorbus decora (Sarg.) Schneider, showy mountain-ash. Common small tree.

RUBIACEAE (Madder Family)
Galium boreale L., northern bedstraw. Several dense patches around the heliport. Although this species is native in the Lake Superior region, this site might be a relict of cultivation. *J 10915* (WIS), *11071.*
Galium triflorum Michaux, sweet-scented bedstraw. Occasional, marshy swales; also in rich woods. *J 10899* (WIS), *11020.*

SALICACEAE (Willow Family)

Populus balsamifera L., balsam-poplar. Rare; well-established as in shrub form at 17 (Fig. 12); also saplings at 1. *J 11061.*

Populus tremuloides Michaux, quaking aspen. Rare, a few seedlings at 1. *J 10916* (WIS).

Salix discolor Muhlenb., pussy willow. *J 11113* (WIS).

Salix humilis Marshall, prairie willow. Occasional, rocky shorelines. *J 11051.*

Salix pyrifolia Andersson, balsam-willow. Reported by Crispin et al. (1985) from 4; not seen in 1994.

SANTALACEAE (Sandalwood Family)

Geocaulon lividum (Richardson) Fern., northern comandra. Common, balsam fir forests and forest/shoreline ecotone. *J 11042* (WIS).

SAXIFRAGACEAE (Saxifrage Family)

Mitella nuda L., miterwort. Common, forests. *J 11024.*

Saxifraga aizoon Jacq. (*S. paniculata*), encrusted saxifrage. T. Occasional, rocky shoreline clifftops and crevices, particularly on the northwest-facing coast (Fig. 11); also near 1. *V 14731.*

Saxifraga tricuspidata Rottb., prickly saxifrage. T. Locally common, rock shoreline crevices particularly at 1, but also at 3 and 18. In the contiguous 48 states, this species is found only on Isle Royale and adjacent islands. *Baggley s.n.*, 7 Sept. 1942 (IRP); *V 14732.*

SCROPHULARIACEAE (Figwort Family)

Castilleja septentrionalis Lindley, eastern paintbrush. T. Fairly common, shorelines and along trail. *Voss 14721.*

**Verbascum thapsus* L., mullein. Rare weed, 12. *J 10907* (WIS).

VIOLACEAE (Violet Family)

Viola adunca J. E. Smith, hook-spur violet. Occasional, rocky shoreline crevices, 3. *J 10935* (WIS).

Viola macloskeyi F. E. Lloyd. Uncommon, wet swale, 6. *J 10936, 11114* (WIS).

Viola selkirkii Goldie. Locally common in young balsam fir forest along trail northeast of 6. *J 10948* (WIS).

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PROSARTES (DISPORUM) TRACHYCARPA (LILIACEAE) IN ISLE ROYALE NATIONAL PARK: NEW TO MICHIGAN AND THE EASTERN UNITED STATES

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While exploring Isle Royale National Park, Keweenaw County, Michigan on 6 June 1994 the first author encountered a species of *Prosartes* D. Don (*Disporum* D. Don) (Liliaceae) near Windigo at the extreme southwestern terminus of the Greenstone Ridge. A few hours later, another location was found seven kilometers away along the Minong Ridge Trail on the rim of a north-south trending canyon. During the course of the summer of 1994 and spring of 1995, four more populations were discovered along a 50-km-long stretch of the northwest-facing coast of the island, and the third author added three new sites in 1997.

These proved to be the first Michigan and eastern United States records for wartyfruit fairy bells (or rough-fruited fairy bells or mandarin) (*Prosartes trachycarpa* S. Wats.; see Shinwari et al. [1994] and Utech et al. [1995] for discussions on the generic alignment of this taxon). Previously known (Fig. 1, adapted from map and specimens cited in Utech et al. 1995) to occur from northern British Columbia eastward through Alberta, Saskatchewan, and Manitoba (Scoggan 1957, 1978-1979) to the James Bay region of northern Ontario, then southward to Oregon, southern Arizona, New Mexico, and the Dakotas and Nebraska (Jones 1951), the species is new to the ranges of both the Gray's (Fernald 1950) and Britton and Brown's (Gleason & Cronquist 1991) manuals. The Isle Royale records (Fig. 2) help span a 1,000-km gap in the range of the species between sites that are 650 km west in Pembina County, North Dakota (Great Plains Flora Association 1977) and 375 km northeast in the James Bay drainage of Ontario (Baldwin 1958, Argus & White 1982, Soper et al. 1989, Morton & Venn 1990).

The only other species in the northern Great Lakes region with which *P. trachycarpa* could be confused is *P. hookeri* Torrey (Hooker's fairy bells), a Pacific Northwest disjunct known east of Montana only from the Porcupine Mountains and Bergland Hills area of Ontonagon County, Michigan (Voss 1972, Marquis & Voss 1981, Mladenoff 1990, Utech et al. 1995 [map], David Foster and Don

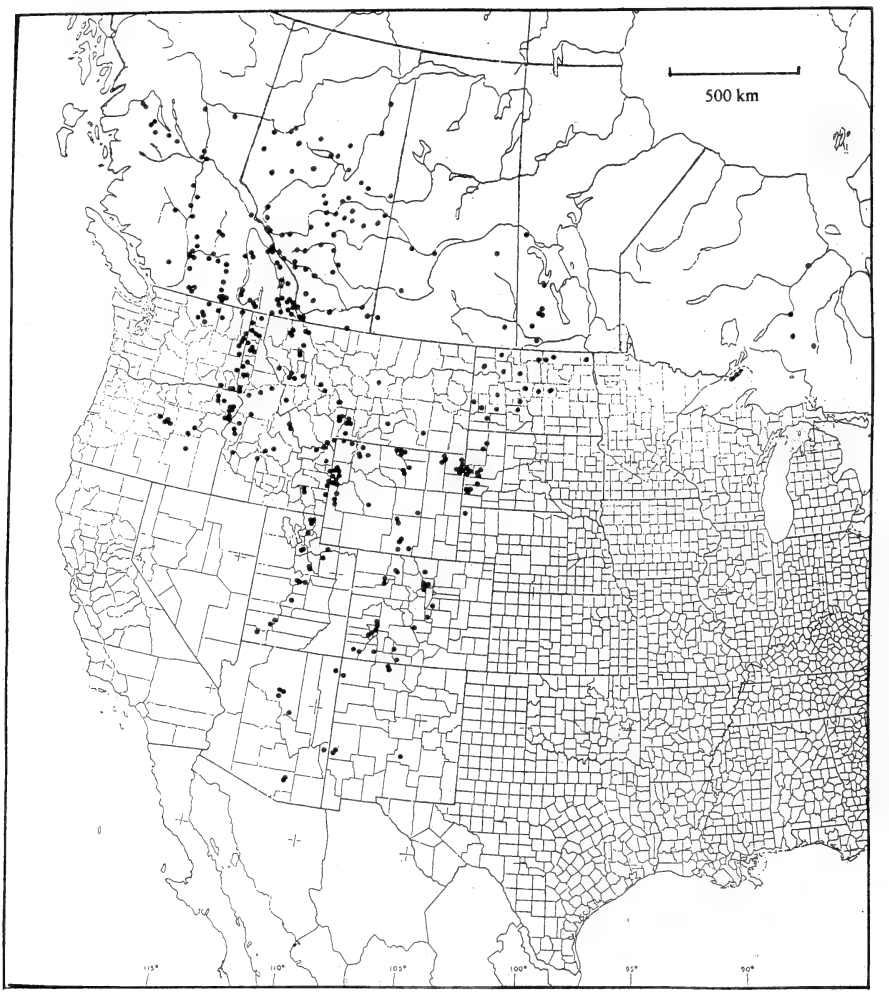

FIGURE 1. Total distribution of *Prosartes trachycarpa*, compiled from sources given in the text, principally Utech et al. (1995).

Henson, 1995–1996 personal communications to Judziewicz). Among other differences, the ovaries of *P. hookeri* have short hairs produced from a smooth surface, while *P. trachycarpa* has glabrous but waxy-verrucose young ovaries. These differences are maintained in the mature berries. The habitats of the two species are quite different in Michigan. In the Porcupine Mountains region, *P. hookeri* grows in rich, well-drained soils of shaded, mesic old-growth forests of sugar maple (*Acer saccharum*) and hemlock (*Tsuga canadensis*), while on Isle Royale *P. trachycarpa* prefers dry-mesic to xeric, basaltic ridgetop white spruce (*Picea glauca*)/glade ecotones.

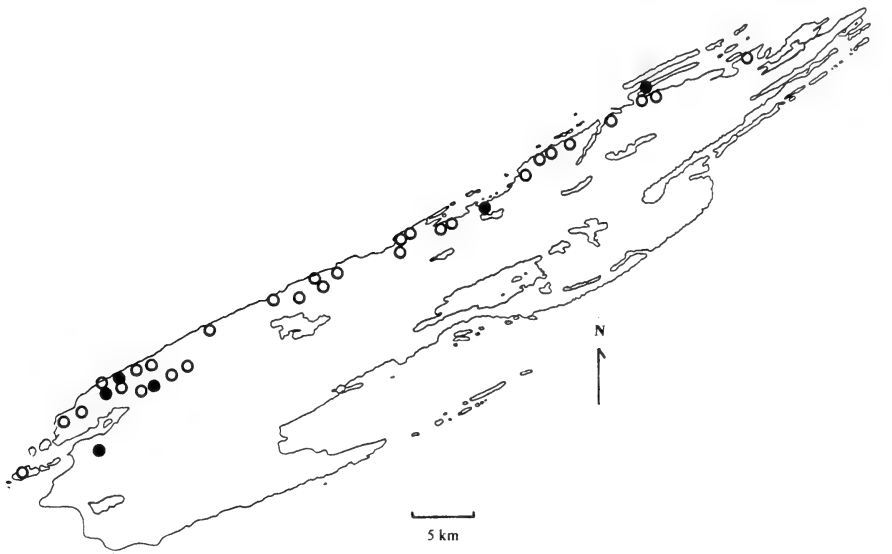

FIGURE 2. Distribution of *Prosartes trachycarpa* on Isle Royale (solid dots) with other potential sites that should be searched (open circles).

DESCRIPTIONS OF ISLE ROYALE POPULATIONS

Table 1 gives a summary of the parameters for each of the nine currently known Isle Royale sites. The first six were discovered by Judziewicz in 1994 and 1995, the last three by Mackinnon in 1997.

1) The "Grace Hill" population occurs several km southwest of Windigo on the Feldtmann Lake Trail (47°53'N, 89'11'W; Sec. 6, T63N R38W), at the extreme southwest end of the Greenstone Ridge. Eighty-one adult and 396 sub-adult and juvenile plants (*Judziewicz 10877*, MICH) were observed on 6 June 1994 in an area only recently made accessible by a trail constructed in 1992-1993. The presence of large adult plants under white spruce (*Picea glauca*) ten or more meters from the trail discounts the remote possibility that the plants could have been introduced by human agency during trail construction. Plants are within 5 meters of a trail on the south (downhill) side of the trail in an open weedy glade, and within 10 (–15) meters of the trail on the north (uphill) side of the trail in the ecotone between the glade and ridge crest boreal forest dominated by white spruce in a strip about 50 meters long (Fig. 3). The weedy glade is dominated by the exotics king devil hawkweed (*Hieracium piloselloides*) and Canada bluegrass (*Poa compressa*). Other common associates were the natives fireweed (*Epilobium angustifolium*), wild sarsaparilla (*Aralia nudicaulis*), rosy twisted-stalk (*Streptopus roseus*), bush-honeysuckle (*Diervilla lonicera*), pearly everlasting (*Anaphalis margaritacea*), big-leaved aster (*Aster macrophyllus*),

TABLE 1. Population characteristics of *Prosartes trachycarpa* and its nine known locations on Isle Royale. Abbreviations for sites: GRH (Grace Hill), HCO (Huginnin Cove Overlook), HTB (West Huginnin Trail Bald), MCR (Minong Canyon Rim), THT (Todd Harbor Trail), RBB (Robinson Bay Bald), MCP (McGinty Cove Peninsula), MCC (McGinty Cove Cliff), MRT (Minong Ridge Trail). n.k. = not known at that time; n.v. = known but not visited.

	SITE								
Parameter	GRH 1	HCO 2	HTB 3	MCR 4	THT 5	RBB 6	MCP 7	MCC 8	MRT 9
Elevation above:									
Sea level (ft)	880	860	950	940	740	720	620	830	810
Lake Superior (ft)	280	260	350	340	240	220	20	230	210
Lake Superior (m)	82	79	107	104	73	67	6	70	64
Distance from Lake Superior (m)	450	300	700	1500	250	150	100	300	2100
1994:									
Number of plants	531	n.k.	3	10	3	125	n.k.	n.k.	n.k.
Fertile plants	50	n.k.	1	3	2	25	n.k.	n.k.	n.k.
1995:									
Number of plants	700-1000	180	n.v.	100	n.v.	n.v.	n.k.	n.k.	n.k.
Fertile plants	262	60	n.v.	73	n.v.	n.v.	n.k.	n.k.	n.k.
1997:									
Number of plants	n.v.	n.v.	ca. 12	n.v.	n.v.	n.v.	15	12	2

bluebead (*Clintonia borealis*), common strawberry (*Fragaria virginiana*), and prickly rose (*Rosa acicularis*), and the exotics common cinquefoil (*Potentilla norvegica*), common dandelion (*Taraxacum officinale*), and wild basil (*Satureja vulgaris*). A return visit on 13 May 1995 revealed the population to be in almost full flower, with 262 fertile plants counted out of a total of 700-1,000 individuals. On this early date the only other flowering herbs on this ridgetop were violets (*Viola pubescens* and a white-flowered species), strawberries, and dandelions.

2) The "West Huginnin Trail Bald" population occurs about 2.5 km by air northwest of Windigo dock, far from a trail on the flank of a rocky summit that had recently been burned (47°55′N, 89°11′W, Sec. 19, T64N R38W). On 26 August 1994 three plants were noted, one with abundant ripe fruit. The vegetation was an open, ecotonal stand of white spruce, white cedar (*Thuja occidentalis*), and pin cherry (*Prunus pensylvanica*) with an understory dominated by wild sarsaparilla, big-leaved aster, velvet-leaved blueberry (*Vaccinium myrtilloides*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), and Northern comandra (*Geocaulon lividum*).

3) The "Minong Canyon Rim" population is 6 km from Windigo dock, along the Minong Ridge Trail (47°56′N, 89°08′W; Sec. 15-16, T64N R38N). Five adults and five sub-adult plants (*Judziewicz 10878*, MICH) were noted on 6 June 1994. A return visit on 15 May 1995 revealed 73 flowering plants (Fig. 4) out of a total population of about 100 individuals. The colony was located in an old, open, rocky white pine (*Pinus strobus*) stand with trees up to 1 m in diameter. Also present were saplings of sugar maple (*Acer saccharum*) and white

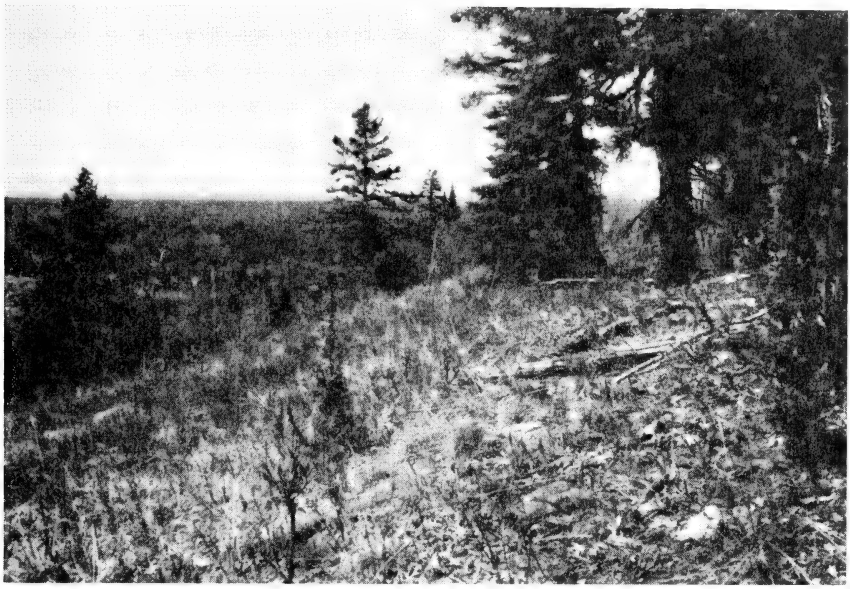

FIGURE 3. Habitat of *Prosartes trachycarpa* on windswept ridgetop ecotone between weedy, grassy, steeply southeast-facing glade (left) and white spruce (*Picea glauca*) forest (right), Grace Hill site, Isle Royale National Park. 6 June 1994.

FIGURE 4. Flowering plants of *Prosartes trachycarpa*, Minong Canyon Rim site. 16 May 1995.

birch (*Betula papyrifera*). Herbaceous associates were wild lily-of-the-valley (*Maianthemum canadense*), bluebead, rosy twisted-stalk, wild sarsaparilla, fireweed, Canada hawkweed (*Hieracium kalmii*), rice grass (*Oryzopsis asperifolia*), and the sedge *Carex pedunculata*. The plants were on more or less level ground, in semi-shade, and although there is no glade associated with the colony, the site is only 100 meters southwest of a small, recent burn on a rocky knoll.

4) The "Todd Harbor Trail" population is short distance east of Todd Harbor Campground (48°03′N, 88°49′W; Sec. 1, T65N R36W) near the ridge summit. Three plants were observed, two in abundant fruit (*Judziewicz 11102*, MICH), on 29 August 1994, on a gentle, southeast-facing 20°slope under an old, open stand of 30–45 cm diameter quaking aspen (*Populus tremuloides*), with scattered white spruce and a few balsam-fir saplings. Dominant understory associates were big-leaved aster and wild sarsaparilla, with a few small individuals of thimbleberry (*Rubus parviflorus*) and round-leaved dogwood (*Cornus rugosa*). The fruits had fallen by the time of a visit on 20 September 1994.

5) The "Robinson Bay Bald" population occurs just below the summit and near the southwestern end of the narrow ridge dividing Amygdaloid Island Channel from Robinson Bay (48°08′N, 89°39′W; Sec. 8, T66N R34W). About 125 plants of all ages (*Judziewicz & Jaunzems 11183*, MICH) were noted on a steep (45°), nearly open (very scattered trees of white spruce and white birch) southeast-facing basaltic scree slope, on 11 August 1994. The dominant associate was common juniper (*Juniperus communis*). Other species present included big-leaved aster, snowberry (*Symphoricarpos albus*), bush-honeysuckle, harebell (*Campanula rotundifolia*), juneberry (*Amelanchier* sp.), rusty woodsia (*Woodsia ilvensis*), king devil hawkweed, common strawberry, field bindweed (*Convolvulus spithamaeus*), wild basil, staghorn sumac (*Rhus typhina*), purple clematis (*Clematis occidentalis*), round-leaved dogwood, choke cherry (*Prunus virginiana*), and rice-grass.

6) The "Huginnin Cove Overlook" population was discovered on 15 May 1995 on the high basaltic ridgetop just inland from Huginnin Cove Campground (Sec. 18, T64N R38W). A total of 180 plants, 60 in flower, were counted in thin soil over basaltic bedrock under an open stand of white cedar, white spruce, balsam fir, and showy mountain-ash (*Sorbus decora*). Other associates were thimbleberry, wild sarsaparilla, big-leaved aster, fireweed, poverty oat-grass (*Danthonia spicata*), and wild lily-of-the-valley.

7) The "McGinty Cove Peninsula" population was located on 25 July 1997 (NW1/4 NE1/4 Sec. 25, T64N R38W), on a small peninsula only a few meters above Lake Superior. Here, 15 plants grew in a white spruce forest with some showy mountain-ash, white cedar, and white birch. Understory associates were thimbleberry, twinflower, bush-honeysuckle, wild sarsaparilla, and naked miterwort.

8) The "McGinty Cove Cliff" population occurs on the summit of the highest lakeside cliff on Isle Royale, about 500 m southeast of population 7 (NE1/4 NE1/4 Sec. 25). A dozen plants were found here on 25 July 1997 in a forest of balsam fir, quaking aspen, and white spruce.

9) The "Minong Ridge Trail" population (SW1/4 SW1/4 Sec. 21, T64N R38W) was found on 30 July 1997. There were two adult plants growing in a

white cedar and yellow birch forest. Other associates were Canada honeysuckle (*Lonicera canadensis*), thimbleberry, bunchberry, and naked miterwort.

WHY OVERLOOKED FOR SO LONG?

There are several possible reasons why *Prosartes trachycarpa* had been overlooked on Isle Royale:

1) Its superficial resemblance to rosy twisted-stalk (*Streptopus roseus*). Although a large herb, *Prosartes trachycarpa* is inconspicuous in the brushy ecotone vegetation of rosy twisted-stalk, wild sarsaparilla, bunchberry, and bush-honeysuckle in which it often grows. Among these species it is difficult to maintain a "search image" for wartyfruit fairy bells; in particular, vegetative plants of fairy bells could easily be mistaken as extreme variants of the ubiquitous rosy twisted-stalk. *Prosartes trachycarpa* differs most obviously from *Streptopus roseus* in its eciliate, broader, slightly cordate, coarser, and more palmately-veined leaf blades with a more shiny yellowish-green rather than dull bluish-green cast in twisted-stalk. The purplish stem is densely short-pubescent, and the few flowers are produced only from the branch tips, never in the leaf axils as in rosy twisted-stalk. The fruits are finely roughened, reddish-orange berries about 1 cm in diameter, compared with the smaller, smooth, shiny, purplish-red berries of *S. roseus*.

2) Early blooming season. On the 6 June 1994 discovery date of *Prosartes trachycarpa*, *Streptopus roseus* was in full bloom throughout the Windigo area whereas all fairy bells plants examined were in young fruit, implying a mid-to late-May flowering period, extremely early considering the late springs of Isle Royale. On 13 May 1995 at this site, *Streptopus* leaves had yet to unfurl from the emergent stem and no flowers were present, while *Prosartes* was in full bloom with unfurled but as yet drooping leaves. Apparently the ridgetop habitat is clear of snow and warms up earlier than other locations in the park. Evidence for this comes from other ridgetop glade communities on Isle Royale, which harbor such showy early species as prairie and fascicled buttercups (*Ranunculus rhomboideus* and *R. fascicularis*), small-flowered blue-eyed mary (*Collinsia parviflora*), and early saxifrage (*Saxifraga virginiensis*), which were in bloom on the Greenstone, Stanley, and Ransom Ridges as early as 15 May during the 1994 field season. These steep, southeast-facing, fire-maintained, often scree-covered glades are thus the earliest plant community to bloom on the island. Wartyfruit fairy bells is actually most easily detected in late summer when the large, terminal, reddish-orange fruits are ripe (Fig. 5). The Todd Harbor population, for example, occurs as a few individuals in "sub-optimal" habitat and would have been overlooked were it not for the presence of mature fruits.

3) Remote locations. The large "Grace Hill" population is on a section of the Greenstone Ridge that was rarely visited until a hiking trail was re-routed through the area in 1992-1993, the two small populations along the Minong Trail could have been easily overlooked in trailside herbage, and the other three localities are off trails in rugged, remote areas.

FIGURE 5. Fruiting plants of *Prosartes trachycarpa*, Grace Hill site. 27 August 1994.

HABITAT REQUIREMENTS

Mladenoff (1990) suggested that in the Porcupine Mountains of Michigan *Prosartes hookeri*, an even more striking disjunct Western disjunct closely related to *P. trachycarpa*, may be limited to areas with deep, prolonged snow cover that protects the below-ground parts from winters that are colder than in the maritime-influenced Pacific Northwest. It seems plausible that potential Isle Royale habitat for *P. trachycarpa* is limited, at least to some extent, by such microclimatic requirements. Blooming occurs very early in the season (mid-May) on steep ridgetops whose microclimate remains unstudied. Such parameters as length of frost-free season, amount of insulating snow cover in the winter, average date of snow melt, and springtime maximum daily temperatures have never been studied here but could be useful in understanding the peculiar distribution of wartyfruit fairy bells on Isle Royale, as well as Hooker's fairy bells in the Upper Peninsula of northern Michigan. We also know little of how the fruits are dispersed, but assume that birds are responsible.

OTHER POTENTIAL HABITATS ON ISLE ROYALE

It seems likely that other populations of *Prosartes trachycarpa* occur on Isle Royale. After its discovery, fairy bells was carefully searched for in other seem-

ingly suitable localities such as the Feldtmann Ridge cliffs on the south side of Feldtmann Lake, and on the Greenstone and Minong/Stanley Ridges. Optimal habitat appears to be near the crests of steep, locally high "hogsback" ridges with an open forest with at least a scattering of white spruce and neither too much (as in areas dominated by thimbleberry and bracken fern (*Pteridium aquilinum*)), too little (the prairie-like scree slope glades of the Stanley Ridge), or too weedy (Greenstone Ridge) vegetation. Sites studied by the second author in Colorado, Wyoming, and Oregon were similiar in their mostly open aspect to the Isle Royale sites. On the island, suitable ridgetop localities appear to be concentrated all along the northwest-facing shore, inland to about the Minong Ridge. Figure 2 shows areas that, based on U.S.G.S. topographic maps and recent air photos, appear most likely to harbor undiscovered populations of wartyfruit fairy bells. The species may also be expected in suitable habitats in the Thunder Bay District of Ontario and extreme northeastern Minnesota.

POTENTIAL THREATS AND CONSERVATION STATUS

It is not certain what impact the high current densities of moose (*Alces alces*) on Isle Royale may have on wartyfruit fairy bells. Certainly, it appeared as if the large Grace Hill population was thriving best in an area that was at least partially protected from moose browse by a dense stand of unpalatable white spruce. The effects of fire on fairy bells are similarly problematical. The species does not occur in any area that has been burned in the recent past, including the 1936 fire area that consumed 20% of the island, but it is possible that it might benefit from fires on a long-term basis—say, every century or so, as at the Minong Canyon Rim site with its scattered, magnificent super-canopy white pines. *Prosartes hookeri* is currently listed as endangered by the Michigan Department of Natural Resources, and *P. trachycarpa*, which appears to be locally commoner, is proposed for listing as endangered.

ACKNOWLEDGMENTS

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FRANKLIN'S PHACELIA (*PHACELIA FRANKLINII* (R. BR.) A. GRAY) (HYDROPHYLLACEAE) ON ISLE ROYALE (MICHIGAN) AND IN THE LAKE SUPERIOR REGION

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Phacelia Jussieu (Hydrophyllaceae) is a New World genus of 130-150 species. The vast majority of phacelias occur in the mountains of western North America (Gillett 1960). Only a handful occur in the eastern and southern United States (Gleason & Cronquist 1991), and none of these taxa range north or west to the Great Lakes drainage basin as natives.

The widespread, predominantly western *Phacelia franklinii* (R.Br.) A. Gray has long been known from disjunct populations in the northwestern Lake Superior region. In western North America the species is known from Alaska, the Yukon, and the Northwest Territories south (irregularly) to Washington, Idaho, Montana, Wyoming, Saskatchewan, and most of Manitoba southeast to Lake Winnipeg. East of Manitoba there is a 600 km gap in Franklin's phacelia's range until it appears again in the Lake Superior region in northeastern Minnesota (Butters & Abbe 1953, Lakela 1965, Coffin & Pfannmuller 1988, Ownbey & Morley 1991); the northwestern Lake Superior shoreline area of Ontario, Canada, especially in the area of Thunder Bay but also north to Ouimet Canyon and east to Rossport (Keddy 1984, Soper et al. 1989); and Isle Royale National Park, Michigan (Brown 1937; Slavick & Janke 1987, 1993). Marquis & Voss (1981) do not mention *P. franklinii* as one of their "western North American plants disjunct in the Great Lakes region," perhaps because of the proximity of western populations in Manitoba.

Franklin's phacelia is an attractive and easily recognized herb. It is an annual or biennial that ranges from 10-60 cm in height. The entire plant is covered by fine appressed hairs, and the pinnatifid leaves are produced both basally and along the branching stems. Each stem branch produces several, hairy, scorpioid cymes with crowded, 5-merous flowers with shallowly bell-shaped pale blue corollas about 1 cm in diameter. The styles are two-cleft and the filaments are exserted for bee pollination. Numerous tiny seeds are produced in July and August, following flowering in June and July. There is apparently no information on the length of viability or germination requirements of the seeds.

The status of *Phacelia franklinii* in Ontario is uncertain, where it is listed as "rare". There are many collections made from 1950 to 1986 in the vicinity of Thunder Bay. However, the species appears to be declining (or overlooked) in Minnesota and Michigan. In Minnesota it is classified as "proposed threatened"; the last collection was made in 1951 and several unsuccessful attempts were made to relocate the species during the 1980's by the Minnesota Department of

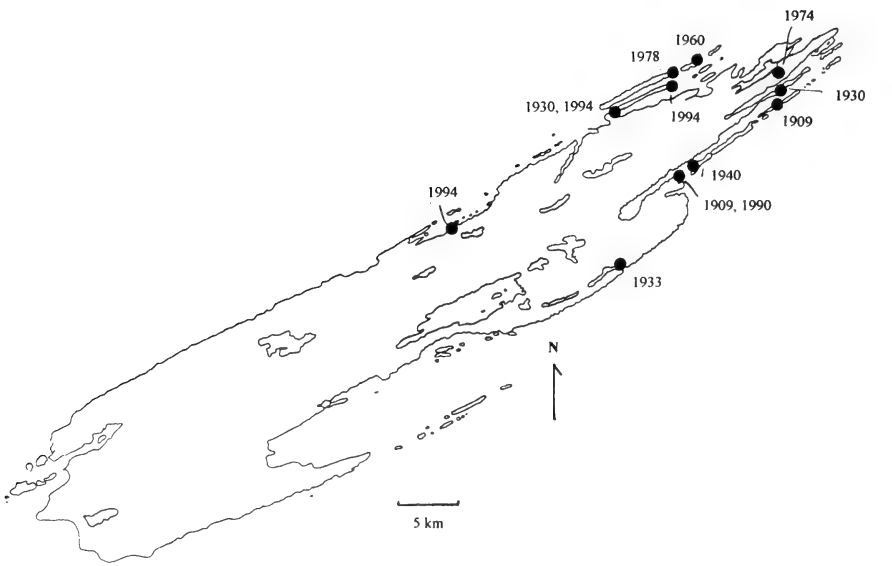

FIGURE 1. Distribution of *Phacelia franklinii* in Isle Royale National Park, Michigan, with dates of collection.

Natural Resources and U.S. Forest Service (Coffin & Pfannmuller 1988). There are, however, more recent sight records in the 1990's (Nancy Sather and Welby Smith, pers. comm.).

In Michigan, Franklin's phacelia is listed as "threatened" and occurs only on Isle Royale (Voss 1996), mostly in gravelly soil derived from basaltic rocks near old fishing camps. Here all eight historical sites with localities specific enough to relocate were revisited during field work in 1993 and 1994 (Fig. 1). At only one, Pickerel Cove Campground, was the species relocated; on the other hand, two new populations were found at disturbed sites on the island. The three extant Isle Royale sites may be characterized as follows:

1) *Belle Isle Campground.* There are three sub-populations here on the dividing ridge just north of the campground, which from about 1920–1950 was the site of a popular tourist resort. The ridge itself was used by visitors as an overlook and so saw considerable human foot traffic. The three sub-populations consist of: a) 25 sterile plants (with no other associates) in the fine soil of a ridgetop anthill (Fig. 2) under the partial shade of balsam fir (*Abies balsamea*), about 75 m from the northeast tip of the island; b) five budding or flowering plants on a dry basalt ledge near the summit of a 670-foot hill about 150 m north of the campground, in partial shade of *Abies balsamea*; common associates were bearberry (*Arctostaphylos uva-ursi*), common juniper (*Juniperus communis*), juneberry (*Amelanchier* sp.), the violet *Viola adunca*, the grass *Elymus trachy-*

FIGURE 2. Open gravelly anthill along ridge near the northeast tip of Belle Isle, Isle Royale National Park, Michigan; habitat of 25 sterile plants of *Phacelia franklinii*. E. Judziewicz photo, 11 July 1994.

caulus, and the sedge *Carex rugosperma*; and c) four flowering plants in *Abies balsamea* forest on dividing ridge 400 m west of Belle Isle dock; common associates were *Arctostaphylos uva-ursi*, *Juniperus communis*, buffaloberry (*Shepherdia canadensis*), a rose (*Rosa acicularis*), wild sarsaparilla (*Aralia nudicaulis*), red honeysuckle (*Lonicera dioica*), and northern paintbrush (*Castilleja septentrionalis*)(Fig. 3).

2) *Pickerel Cove Campground*. About 100 plants (70 in fruit) about 30 m northeast of campsite, on a weedy, open, lichenous (*Cladonia* spp.) basaltic ridge with scattered trees of white spruce (*Picea glauca*) and white birch (*Betula papyrifera*); native associates included *Arctostaphylos uva-ursi*, tufted hairgrass (*Deschampsia cespitosa*), Douglas' knotweed (*Polygonum douglasii*), poverty oatgrass (*Danthonia spicata*), harebell (*Campanula rotundifolia*), wild strawberry (*Fragaria virginiana*), cow-wheat (*Melampyrum lineare*), rusty woodsia (*Woodsia ilvensis*), pale corydalis (*Corydalis sempervirens*), and rock spikemoss (*Selaginella rupestris*); exotics present were mouse-ear chickweed (*Cerastium fontanum*), yellow hawkweed (*Hieracium piloselloides*), creeping sandwort (*Arenaria serpyllifolia*) and a tiny veronica (*Veronica verna*).

3) *Todd Harbor Campground*. About ten sterile plants in bare, loamy soil of weedy tent pad (no rock or gravel in the immediate vicinity), with *Cerastium fontanum* and annual bluegrass (*Poa annua*).

Is it possible that fire and its exposure of fresh gravelly soil (or its equivalent

FIGURE 3. Flowering plant of *Phacelia franklinii* in dense bearberry (*Arctostaphylos uva-ursi*) and buffaloberry (*Shepherdia canadensis*) heath on basaltic ridge just northwest of Belle Isle Campground, Isle Royale National Park, Michigan. E. Judziewicz photo, 11 July 1994.

in road maintenance activities in Ontario and fishing camp maintenance on Isle Royale) may be necessary to the continued viability of populations of *Phacelia franklinii*? Given its possible decline and our ignorance of its autecology, it seems appropriate to cite full specimen data from collections examined at regional herbaria (DUL, IRP, LKHD, MICH, MIN, MSC, ND, and WIS), as well as my 1994 sight records from Isle Royale, Michigan.

MICHIGAN. KEWEENAW CO.: Isle Royale National Park: Rock Harbor Lighthouse, Sec. 26, T66N R34W, 14 July 1909, *Cooper 96* (MIN), not relocated in 1994; "Greenstone Island" (= Smithwick Island), Secs. 4 and 9, T66N R33W, 9 Aug. 1909, *Cooper 315* (MIN), not relocated in 1994; trail between Rock Harbor and Tobin Harbor, in rock opening, 1 July 1930, *Brown 3091* (MICH), not relocated in 1994; campsite at head of Pickerel Cove [old fishing camp site], Sec. 8, T66N R34W, 5 Aug. 1930, *McFarlin 2373* (MICH), relocated on 11 August 1994, *Judziewicz & Jaunzems s.n.* (MICH); Chippewa Harbor, Sec. 17, T65N R34W, 14 June 1933, *Hebert 3488* (ND), not relocated in 1994; [West] Caribou Island, Sec. 23–24, T66N R33W, 3 July 1940, *Baggley s.n.* (MICH, MSC), not relocated in 1993–1994; Captain Kidd Island fishing cabin, Sec. 25, 26 and 35, T67N R34W, in open gravelly soil, 29 June 1960, *Janke s.n.* (MICH), not relocated in 1994; Greenstone Ridge [trail SW of Lookout Louise?], 24 June 1974, *Thomson & Edwards s.n.* (MICH), not relocated in 1994; Crystal Cove, Amygdaloid Island, near fishing cabin, in open rocky mat of *Arctostaphylos uva-ursi*, Sec. 34, T67N R34W, 2 June 1978, *Janke s.n.* (IRP), not relocated in 1994; Edisen Historic Fishery, sunny open yard, Sec. 26, T66N R34W, 27 June 1990, *Weber s.n.* (IRP), not relocated in 1994; Belle Isle Campground [former lodge and fishing camp site] and vicinity, three sub-populations on dividing ridge north of campground, Sec. 35, T67N R34W, 11 July

1994, *Judziewicz s.n.* and photographic record; Todd Harbor Campground, Sec. 1, T65N R36W, 3 Aug. and 20 Sept. 1994, ten sterile plants in periodically disturbed clayey gravel of tent pad, *Judziewicz 11184* (MICH).

MINNESOTA. COOK CO.: Grand Marais, 25 June 1891, *Cheney* (MIN), and anno 1935, *Koelnau 110* (MIN); Lutsen, T60N R3W, 8–9 June 1935, *Nielsen & Breckinridge 3157* (MIN); South Fowl Lake, T64N R3E, 17 July–7 Aug. 1938, *Burns & Hendrickson 323* (MIN), 1–5 July 1939, *Butters & Moore 10820* (MIN); rare, cliff on south side towards W end of Mountain Lake, T65N R2E, 2–14 July 1937, *Butters, Abbe, & Abbe 296* (MIN); 12 July 1938, *Butters, Burns, & Hendrickson 118* (MIN, US). LAKE CO.: near Palo, anno 1951, sandy clearing in *Pinus banksiana* forest, rare, *Lakela s.n.* (DUL, MIN).

ONTARIO. THUNDER BAY DIST.: North Fowl Lake [on border with Minnesota], 27 June-3 July 1940, *Butters, Abbe, & Burns 697* (MIN); Slate River, gravelly bank, 11 June 1933, *Garton s.n.* (LKHD); Round Lake, gravelly bank on lakeshore, 25 July 1950, *Garton 1211* (LKHD); road to Silver Falls, 8 mi N of Hwy. 17-A, recently cleared gravel roadsides, 29 June 1958, *Garton 5516* (LKHD); Cooper's Gravel [or Shale] Pit 9 mi SW of Fort William, cleared edge, 2 June 1955, *Bailey 364* (LKHD), 1 July 1966, *Garton 10119* (LKHD), *Hartley 68-15* (LKHD); Kaministiqua Village, 48°32′N, 89°35′W, gravelly road shoulder, 2 June 1976, *Garton 17029* (LKHD), 8 July 1978, *Garton 18194* (LKHD); 3 km SW of Kakabeka Falls, Pineview Road, recently disturbed road shoulder in residue of brush-burning site, 3 July 1979, *Garton 18821* (LKHD); Kakabeka Falls, 48°24′N, 89°37′W, recently graded sandy roadside under *Pinus banksiana*, *Garton 19527* (LKHD); Ouimet Canyon parking lot, 16 July 1986, *Garton 23296* (LKHD); Rosslyn, 48°23′N, 89°29′W, dry gravelly bank, 21 June 1966, *Beckett 37* (LKHD); Kaministiqua River, 48°22′N, 89°35′W, dry sandy and gravelly floodplain with "secondary relictual prairie" with *Epilobium angustifolium*, *Rosa acicularis*, *Prunus virginiana*, and *Ribes* sp., 15 Sept. 1979, *Foster s.n.* (LKHD); Nipigon River, anno 1876, *Smith s.n.* (US).

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MICHIGAN'S FARTHEST NORTH: A BOTANICAL VISIT TO THE GULL ISLANDS, ISLE ROYALE NATIONAL PARK

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From Blake Point at the northeastern end of the main island of Isle Royale, Passage Island with its dark balsam-fir forests, rocky hills, and lighthouse stand out in bold relief (Judziewicz, this issue). On clear days, much tinier, even more remote points of land are visible on the northeastern horizon, northeast of Passage Island. These barren rocky hummocks, tinged bright orange by abundant growths of the lichen *Xanthoria elegans*, are the Gull Islands, the northernmost points of land in Michigan (Sec. 29-30, T68N R31W; 48°15′N, 88°15′W). They are located 5.5 km east of the northeastern tip of Passage Island and form the extreme northeasternmost extension of the Greenstone Ridge Lava Flow that constitutes the backbone of Isle Royale, at a point where the Isle Royale Fault turns from northeastward towards the east (Huber 1973, 1975). Four main islets (Fig. 1) extend from west to east for a total distance of 750 m. They have areas of 0.2, 0.8, 0.6, and 1.2 ha and maximum elevations above Lake Superior of about 4, 9, 9, and 13 m respectively (Fig. 1). The largest, easternmost islet (hereafter referred to as East Gull Island) is 15 km from Blake Point and only 200 m from the international boundary with Canada.

On 16 August 1994, in the company of National Park Service (NPS) Ranger Bob Whaley and Resource Management Specialist Jack Oelfke, I had the opportunity to visit East Gull Island, which had been visited by botanists only twice previously. William S. Cooper (1913a, 1913b, 1914) noted or collected 26 vascular plant species during a visit to the Gull Islands on 24 August 1909 (Fig. 2). Not all of these species are listed in his paper; vouchers are deposited in the Gray Herbarium (GH) of Harvard University. On the north side of the island Cooper reported a low, open forest of mountain-ash (as "*Pyrus americana*," actually *Sorbus decora*; Figs. 3–4) with a thicket-like understory of Canada yew (*Taxus canadensis*), skunk currant (*Ribes glandulosum* [as "*Ribes prostratum*"]), hawthorn-leaved gooseberry (*R. oxyacanthoides*), red raspberry (*Rubus idaeus*), bristly rose (*Rosa acicularis*), red-berried elder (*Sambucus racemosa*), red-osier dogwood (*Cornus stolonifera*), and tea-leaved willow (*Salix planifolia* [as "*Salix phyllicifolia*"]). He reported the dominant plant on the summit and south slope of this weather-beaten, guano-covered rock as bluejoint (*Calamagrostis canadensis*) and commented on the large number of herring gulls present, "accompanied by many smaller birds and by untold millions of flies and gnats, evidently living upon the decaying animal matter, which is abundant and offensive . . ." Cooper collected four rare species: hoary whitlow-grass (*Draba incana*), the first record for the 48 contiguous states; spreading wood fern (*Dry-*

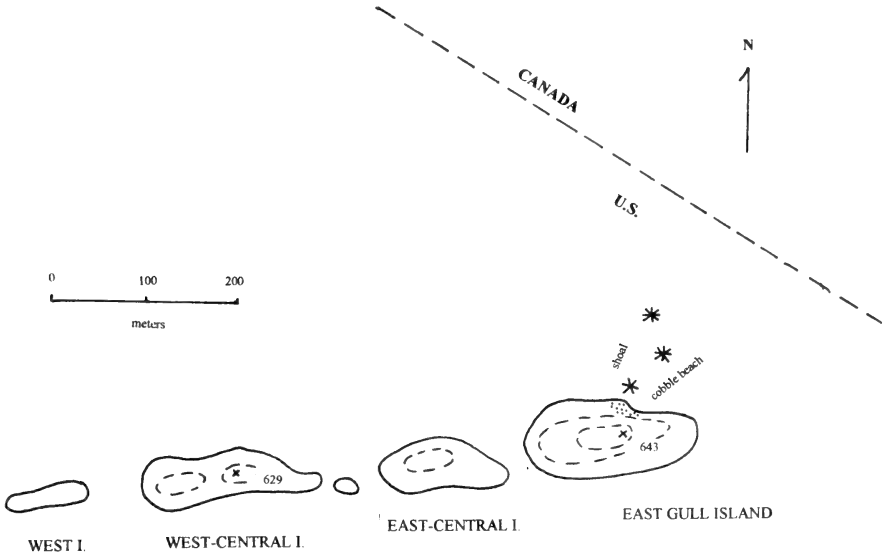

FIGURE 1. Map of the Gull Islands (48°15′N, 88°15′W), redrawn from the USGS topographic map.

opteris expansa); devil's-club (*Oplopanax horridus*, noting six flowering plants); and hawthorn-leaved gooseberry (*Ribes oxyacanthoides*).

Apparently there were no more visits by botanists until 1980, when G.J. Cebelak (1983) boated past, but did not land on, the northern shore of East Gull

FIGURE 2. Cooper's (1913b) view of the northwestern "beach" of East Gull Island, as viewed from the east-central island in the Gull chain. 24 August 1909.

FIGURE 3. East Gull Island as viewed from the north. Note the small cobble beach and showy mountain-ash (*Sorbus decora*) copse on the far right (compare with Fig. 2).

FIGURE 4. View northwest from the summit of East Gull Island; note scattered showy mountain-ash trees on north slope, cobble beach with raft (right), and thicket of spreading woodfern (*Dryopteris expansa*) at lower left.

Island and observed a "four square meter" patch of devil's-club growing out of the north-facing cliffs under an overstory of showy mountain-ash. It is uncertain whether his "four square meter" estimate represents the total area covered, or a patch four meters on a side, which is closer to the colony's 1994 size.

Our visit found the islet to be similar to Cooper's description, with a few notable exceptions. There were old gull nests but only a few, and the birds were not in evidence—certainly not the "enormous numbers" of Cooper's account. The dominant plant species were identical to those seen in 1909 except that red-osier dogwood and Canada yew (or any other gymnosperm) were absent. Of his other species only *Juncus filiformis* and *Salix planifolia* were not relocated. We newly collected the Michigan State special concern downy oat grass *Trisetum spicatum*. In 1994, the colony of devil's-club (Fig. 5) was larger than either Cooper or Cebelak described. It occurs just inland of the fireweed (*Epilobium angustifolium*) zone of a cobble beach on the north side of the island—the farthest north point of land in Michigan. There were about ten plants bearing a total of 30-50 vigorous stems with 10-15 young infructescences in an area about 15 meters long and 5 meters wide, with most plants only a meter above lake level and in the partial to dense shade of trees of showy mountain-ash. Spreading wood-fern was co-dominant in the understory along with a few plants of white mandarin or white twisted-stalk (*Streptopus amplexifolius*). The mountain-ash grove seems to have increased in size since the photograph taken by Cooper (1913b) in 1909 (Fig. 2).

FIGURE 5. Devil's-club (*Oplopanax horridus*) in understory of showy mountain-ash copse on East Gull Island; note fireweed (*Epilobium angustifolium*) in foreground.

Cooper summarized the vegetation of the Gull Islands as "a strange mixture of shore and forest plants, the latter in spite of the bareness of the islands including some that habitually grow in deep shade." How can this tiny patch of forest with mesophytic elements thrive so close to lake level on these tiny, remote, exposed islets? It seems possible that the shallow rocky reef or shoal located about 100-200 m offshore to the north (visible in the upper left in the 1909 Cooper photograph) may help to break northerly or northwesterly gales, and that guano from gulls has accumulated on the north slope, forming small, rich soil pockets that support nutrient-demanding plants such as nettles (*Urtica dioica*) and white mandarin.

The other three, smaller, lower, more westerly islets in the Gull chain (Fig. 6) were not visited owing to rough weather. The most westerly islet does not appear to support any vascular plants, while the middle two are covered with sparse thickets of what appeared to be fireweed and bluejoint, but with no larger woody plants visible.

The flora of the Gull Islands is floristically unbalanced (MacArthur & Wilson 1967), probably owing to their extreme isolation. Such ubiquitous Isle Royale rock shoreline species as junipers (*Juniperus* spp.), harebell (*Campanula rotundifolia*) and yarrow (*Achillea millefolium*)—as well as any other member of the Asteraceae—are absent, yet the mesophytic white mandarin is common. Cooper (1913b) mentions that 10 out of his 26 species "bear more or less edible

FIGURE 6. View west from cobble beach on north side of East Gull Island, showing the east-central and west-central Gull Islands.

berries . . ." suggesting bird dispersal. In the present survey 13 of the 31 species seen had fleshy fruits, about the same percentage.

Thirty-one species were observed on East Gull Island in 1994; four of Cooper's reported species were not found. This suggests a minimum turnover rate of 4/31 divided by 85 years or 0.15% per year, but this is a very crude estimate, since some species might have gone extinct and then recolonized the islands (perhaps more than once!) in the intervening decades. Multiple visits over the years would certainly clarify the true rate of species turnover on these remote isles.

The moss *Polytrichum pallidisetum* Funck (*Judziewicz 11153*, MICH) was also collected on the Gull Islands.

Small as they are, the Gull Islands are not quite the northeastern terminus of the Isle Royale archipelago. About 7–8 km east of them, in Canadian waters, lies Bateau Rock. It was not seen from the summit of East Gull Island and must be low—only a meter or two above water level—and probably lacks vascular plants.

The following list of plants follows the system and nomenclature used by Slavick & Janke (1993). All vouchers are the author's and are deposited at the University of Michigan herbarium (MICH) unless noted. An asterisk (*) denotes an exotic species; "SC" and "Thr" denote species that are listed as of "Special Concern" or "Threatened" by the Michigan Department of Natural Resources.

PTERIDOPHYTES

ASPLENIACEAE (Spleenwort Family)

Dryopteris expansa (Presl) Fraser-Jenkins & Jermy, spreading wood fern. Common, deep soil on north slope, particularly in the mountain-ash grove (Fig. 4, lower left). SC. *11148.*

LYCOPODIACEAE (Clubmoss Family)

Lycopodium dendroideum Michaux, ground-pine. Local, summit. *11160.*

POLYPODIACEAE (Polypody Family)

Polypodium virginianum L., common polypody. Occasional, rock crevices. *11166.*

GYMNOSPERMS

TAXACEAE (Yew Family)

Taxus canadensis Marshall, Canada yew. Listed by Cooper (1913b) as frequent during visit of 24 August 1909; not seen in 1994.

ANGIOSPERMS

MONOCOTYLEDONS

CYPERACEAE (Sedge Family)

Carex brunnescens (Pers.) Poiret. Local, one clump on north slope mesic area. *11175.*

JUNCACEAE (Rush Family)

Juncus filiformis L. Listed by Cooper (1913b) in 1909; not seen in 1994.

LILIACEAE (Lily Family)

Streptopus amplexifolius (L.) DC., white mandarin. Fairly common, deep soiled areas of north slope, particularly in mountain-ash grove. *11162.*

POACEAE (Grass Family)

Calamagrostis canadensis (Michaux) P. Beauv., bluejoint (Fig. 7). Dominant grass. *11146.*

**Poa annua* L., annual bluegrass. Local, gull nesting areas at summit. *11152* (WIS).

Poa nemoralis L., a bluegrass. Common, exposed rocks. *11147.*

Poa palustris L., fowl meadow grass. Occasional, moist crevices. *11155.*

Trisetum spicatum (L.) Richter, downy oat grass. Local, summit rock crevice on west side. SC. *11165.*

DICOTYLEDONS

ARALIACEAE (Ginseng Family)

Aralia hispida Vent., bristly sarsaparilla. A large colony on the summit. *11157, 11170.*

Oplopanax horridus (J.E. Smith) Miquel, devil's-club. Locally common under the showy mountain-ash grove (Fig. 5). Thr. *11159.*

BRASSICACEAE (Mustard Family)

Draba incana L., hoary whitlow-grass (Fig. 8). About 200 plants in crevices and rock faces at the west end. Thr. *11154.* The only other stations for this species in Michigan are at the extreme northeast end of Passage Island, including two offshore islets (Freudenstein & Marr 1986), where it grows on northwest-facing cliffs where guano from gulls accumulates. There it grows with bluejoint (*Calamagrostis canadensis*), harebell (*Campanula rotundifolia*), and yarrow (*Achillea millefolium*), the latter two species absent from the Gull Islands.

FIGURE 7. View southwest from the summit of East Gull Island; dominant plants are bluejoint (*Calamagrostis canadensis*), fireweed (*Epilobium angustifolium*), and showy mountain-ash. Passage Island is on the near horizon left of center; the main island of Isle Royale is on the far left of the far horizon.

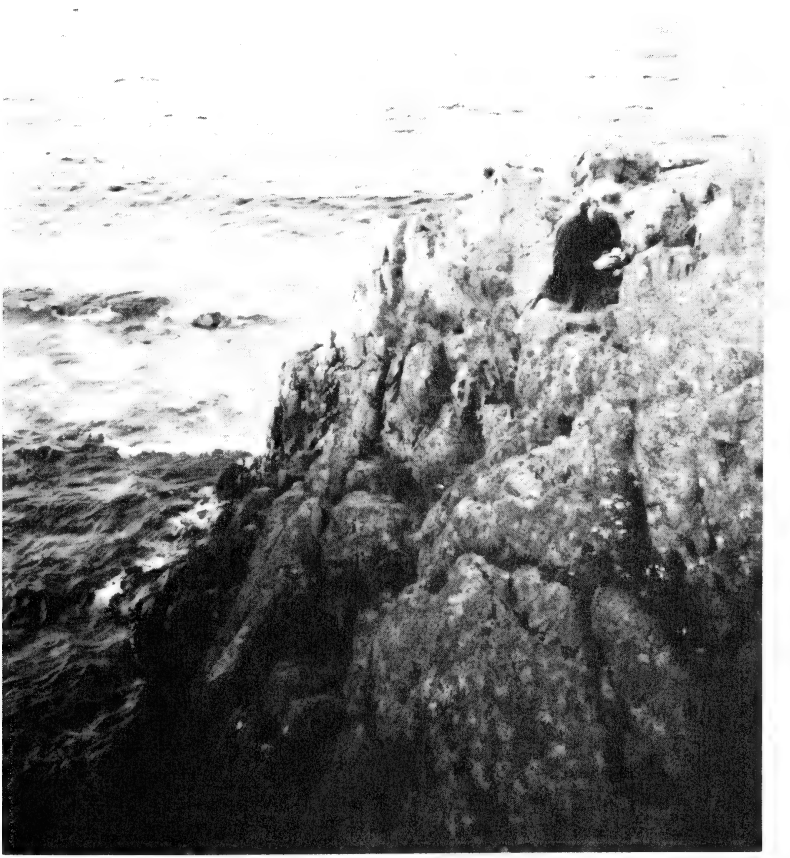

FIGURE 8. Jack Oelfke in habitat of hoary whitlow-grass (*Draba incana*) near the western end of the summit ridge of East Gull Island.

CAPRIFOLIACEAE (Honeysuckle Family)

Sambucus racemosa L., red-berried elder. Fairly common, especially on north slope. *11167.*

CARYOPHYLLACEAE (Pink Family)

Stellaria borealis Bigelow, stitchwort. Occasional, summit and south slope crevices. *11156.*

CORNACEAE (Dogwood Family)

Cornus canadensis L., bunchberry. Local in soil on north slope. *11174.*

Cornus stolonifera Michaux, red-osier dogwood. Reported by Cooper in 1909; not seen in 1994.

ERICACEAE (Heath Family)

Vaccinium angustifolium Aiton, early blueberry. Several small patches on summit. *11169.*

GROSSULARIACEAE (Gooseberry Family)

Ribes glandulosum Grauer, skunk currant. Fairly common, north slope and summit. *11149.*

Ribes oxyacanthoides L., hawthorn-leaved gooseberry. Local, west end summit crevices. SC. *11145* (WIS).

ONAGRACEAE (Evening-Primrose Family)

Epilobium angustifolium L., fireweed. Common throughout; forming a dense stand in back of the north cobble beach (Fig. 5). *11157.*

Epilobium ciliatum Raf., willow-herb. Occasional, especially on rocks at west end of cobble beach; may be Michigan's farthest north vascular plant. *11150.*

POLYGONACEAE (Buckwheat Family)

Polygonum cilinode Michaux, fringed bindweed. Local on summit; also noted by Cooper in 1909. *11171.*

**Rumex acetosella* L., sheep sorrel. Occasional at summit near gull nests. *11164.*

PRIMULACEAE (Primrose Family)

Trientalis borealis Raf., starflower. Uncommon in rich soil pockets of north slope. *11161* (WIS).

ROSACEAE (Rose Family)

**Potentilla norvegica* L., common cinquefoil. Occasional throughout. *11151.*

Potentilla tridentata Sol., three-toothed cinquefoil. Local on west side of summit. *11168.*

Rosa acicularis Lindley, bristly rose. Occasional throughout.

Rubus idaeus L., red raspberry. Common. *11163.*

Sorbus decora (Sarg.) Schneider, showy mountain-ash. Forming a small grove in back of the north beach (Figs. 3-7).

SALICACEAE (Willow Family)

Salix planifolia Pursh, tea-leaved willow. Reported by Cooper (1914); not seen in 1994. Thr.

SANTALACEAE (Sandalwood Family)

Geocaulon lividum (Richardson) Fern., northern comandra. Local, north slope in rich soil. *11173.*

URTICACEAE (Nettle Family)

Urtica dioica L., stinging nettle. Local, cobble beach on north shore; also noted by Cooper in 1909. *11172.*

ACKNOWLEDGMENTS

Jack Oelfke, Dave Soleim, and Bob Whaley of the National Park Service provided logistical support for this project. All photographs were taken by the author except for Fig. 2, which was taken by W.S. Cooper in 1909. This paper is dedicated to the memory of Joseph R. Judziewicz, who passed away during my visit to the Gull Islands.

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CONTENTS

On the cover: Looking southwest along the southeast-facing coast of Passage Island; the lighthouse is to the left of center, Blake Point on the main island of Isle Royale on the left horizon. Photograph was taken about 0.5 km from the northeastern tip of the island, 21 June 1994, by E. J. Judziewicz.

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RECENT WISCONSIN RECORDS FOR SOME INTERESTING VASCULAR PLANTS IN THE WESTERN GREAT LAKES REGION

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ABSTRACT

The abundance, habitat preferences, and threats to 21 rare species of Wisconsin's Lake Superior drainage are discussed in the context of their distribution in the western Great Lakes region including Minnesota and Michigan. *Eriophorum chamissonis* and *Ranunculus lapponicus* are reported as new for Wisconsin, while *Lonicera involucrata*, *Pyrola minor*, and *Vaccinium vitis-idaea* were rediscovered after absences of nearly a century. The status of the potentially weedy exotics *Filipendula ulmaria* and *Juncus ensifolius* is discussed. Regional population trends and clarification of habitat preferences are discussed for *Armoracia lacustris*, *Carex pallescens*, *Gnaphalium sylvaticum*, *Juncus vaseyi*, *Listera auriculata*, *L. convallarioides*, *Lycopodium selago*, *Mertensia paniculata*, *Myriophyllum alterniflorum*, *Petasites sagittatus*, *Pinguicula vulgaris*, *Senecio congestus*, *Streptopus amplexifolius*, and *Trisetum spicatum*.

INTRODUCTION

In the 1970s, Wisconsin Department of Natural Resources botanists William E. Tans and the late Robert H. Read (1949–1994) surveyed many wetlands and cliffs of Wisconsin's Lake Superior shorelines (Tans 1983, Tans & Read 1975). More intensive field work in this area from 1991–1996 has resulted in improved knowledge of the distributions and habitat preferences of a number of rare vascular plant species occurring in the western Lake Superior region (Judziewicz 1993, 1995, 1996, 1997; Judziewicz & Koch 1993). The following notes discuss the regional status of 21 rare species selected on the basis of new information gathered concerning their distribution, clarification of their habitat preferences, and demographic trends. Maps are provided for those taxa that were either overlooked and should be sought in a wider geographic area, or have changing distributional status (such as *Eriophorum chamissonis* and *Senecio congestus*).

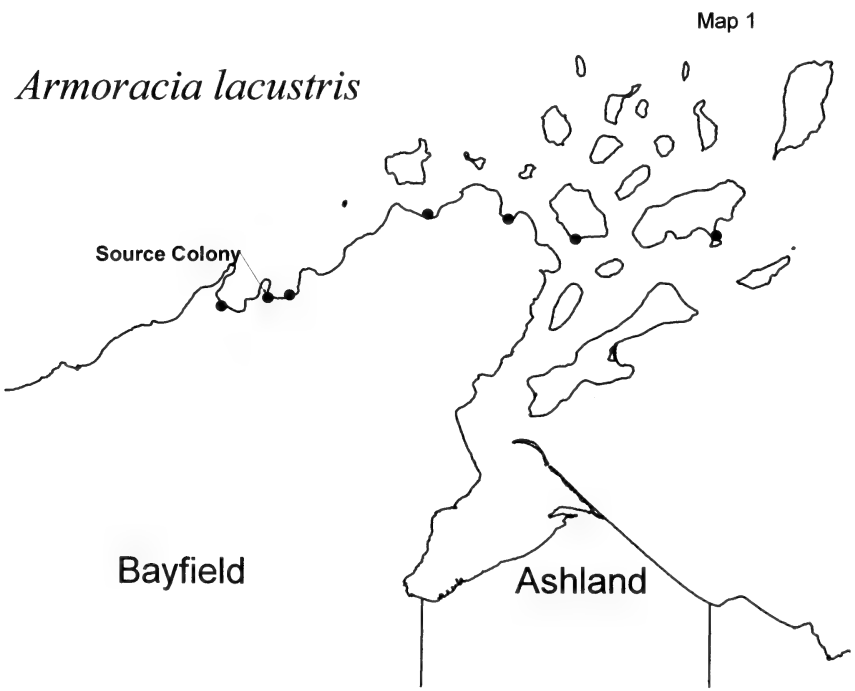
Perhaps these notes will encourage other biologists in the three western Great Lakes states to search afresh for previously "lost" rare species (such as *Pyrola minor*), to search for species that might turn up new to their jurisdictions (*Vaccinium vitis-idaea* in the Upper Peninsula of Michigan), to be alert for potentially pernicious invaders (*Filipendula ulmaria*), to notice and document population trends in species that are adversely affected by herbivores (*Streptopus amplexifolius*) or possibly climate change (*Pinguicula vulgaris*), and to continue monitoring small populations of rare species that are liable to suffer extinctions through stochastic processes (*Gnaphalium sylvaticum*).

The authors' collections are abbreviated "J" and "N", respectively, and unless indicated are deposited at the University of Wisconsin-Madison (WIS) and University of Wisconsin-Green Bay (UWGB) herbaria, respectively. Scientific names follow Gleason & Cronquist (1991), which was also relied upon for continental distributional data. Regional floristic treatments for Michigan (Voss 1972, 1985, and 1996; plus Natural Features Inventory Files) and Minnesota (Coffin & Pfannmuller 1988; Ownbey & Morley 1991) were also consulted and are the basis for many of the distribution records.

1. *Armoracia lacustris* (A. Gray) Al-Shehbaz & V. Bates, lake cress (Mustard family, Brassicaceae). Conservation status: Federal, considered for Category 2 listing; Mich., threatened; Minn., not known from state; Wis., endangered. (Map 1)

This rare aquatic mustard is found in scattered stations from Minnesota to Quebec, south to Texas and Florida. It is rare in Wisconsin, with only a few stations known (Patman & Iltis 1962). In Wisconsin's Lake Superior region lake cress has been known since 1979 from the outlet of Lost Creek near Cornucopia, Bayfield County, Wisconsin, where thousands or tens of thousands of plants occur. However, intensive surveys from 1991–1996 revealed no other populations in Wisconsin's Lake Superior coastal wetlands.

Lake cress reportedly flowers from June through August, but the plants rarely set fruit (Gleason & Cronquist 1991). Vegetative reproduction does occur



by way of floating leaves that readily break off from the stem, then produce adventitious roots, and regeneration can also occur from stem fragments (Voss 1985). In this context, it is interesting to note the great distances that propagules are carried from the presumed parent population at Lost Creek by the eastward flowing Lake Superior currents in the Bayfield Peninsula/Apostle Islands region. Fragments of leaves and stems have been found up to 50 km away, from the source colony near Cornucopia, all the way to Oak and Stockton Islands. At most sites, the fragments were not observed to root, but on the most distant site on Stockton Island a plant occurring near the mouth of a lagoon was beginning to root in shallow water in 1992; however, the species was not relocated at this site in succeeding years. It is rare that such long-distance dispersal can be attributed with fair certainty to a known source colony, and belies the suggestion by Les *et al.* (1995) that "The lack of seed production, however, greatly compromises the ability of the species to disperse beyond local distances. . . . The leaves are probably difficult to transport over any significant distance . . ."

Wisconsin Lake Superior drainage basin sites: Large source population: BAYFIELD CO.: Lost Creek, Sec. 32, T51N R6W, at least 10,000 plants in 1 m of quiet water over sandy bottom, 2 Sept. 1979, *Alverson s.n.* (WIS); in 1995 about 1,000 stems were observed here.

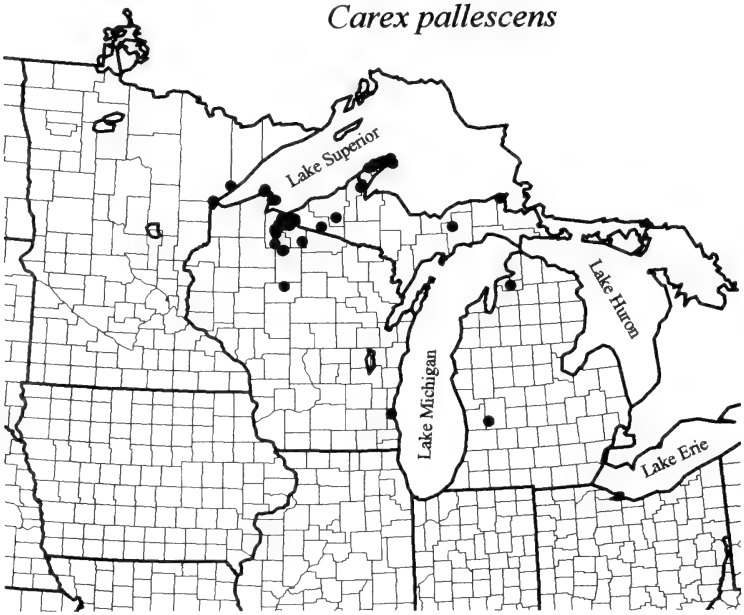
Fragments washed up on Lake Superior beaches: ASHLAND CO.: Oak Island sand spit ca. 35 km [by air] E of Lost Creek colony, 17 Aug. 1991 (not relocated in 1992 or 1996), *J-7767*; Stockton Island, Julian Bay Lagoon outlet ca. 50 km E of Lost Creek colony, 18 Aug. 1992 (not present in 1993–1996), *J-9866*. BAYFIELD CO.: Siskiwit Bay beach over 1 km E of Lost Creek colony, 15 June 1995, *J-11239*; Bark Bay beach ca. 5 km W of Lost Creek colony, 21 June 1995, *J-11239*; Sand River mouth beach ca. 18 km E of Lost Creek colony, 20 June 1995, *J-11266*; Raspberry bay beach ca. 28 km E of Lost Creek colony, summer 1994, J.E. Meeker sight record.

2. *Carex pallescens* L. var. *neogaea* Fern., pale sedge (Sedge family, Cyperaceae). Conservation status: Federal, none; Mich.: special concern; Minn.: none, proposed endangered; Wis.: special concern. (Map 2)

This distinctive circumboreal species is found in North America south to northern Minnesota (several stations in the Lake Superior counties; Coffin & Pfanmuller 1988), northern Wisconsin (Bayfield, Ashland, Iron, Milwaukee, Price, and Taylor Counties), northern Michigan (many Upper Peninsula records, particularly in the Ironwood and Houghton areas), Ohio, and New Jersey.

Surveys in 1996 revealed *Carex pallescens* var. *neogaea* to be locally common in roadside ditches in the Mellen to Hurley area of Ashland and Iron Counties. Here the species prefers periodically disturbed, moist, partially shaded trailsides and roadsides partly shaded by conifers such as balsam-fir and white spruce. The most abundant associates are the native species *Onoclea sensibilis*, *Carex castanea*, *C. vulpinoidea*, *Danthonia spicata*, *Agrostis stolonifera*, *Scirpus atrovirens*, *Euthamia graminifolia*, *Aster lateriflorus*, *A. simplex*, *A. ciliolatus*, *A. umbellatus*, *Solidago canadensis*, *S. uliginosa*, *Platanthera lacera*, *Salix discolor*, *S. pyrifolia*, *Fragaria virginiana*, *Juncus tenuis*, *Juncus effusus*, and *Pteridium aquilinium*. Even more common, usually, are exotic associates such as *Achillea millefolium*, *Trifolium hybridum*, *T. pratense*, *Phleum pratense*, *Plantago lanceolata*, *Chrysanthemum leucanthemum*, *Ranunculus acris*, *Rumex acetosella*, *Anthoxanthum odoratum*, *Prunella vulgaris*, *Lotus corniculatus*, and

Map 2



Juncus ensifolius. In only two of several dozen locations was pale sedge located in seemingly natural vegetation: 1) a single clump in a white cedar swamp near a road a few miles south of the village of Iron Belt, Iron County (1996); and 2) rock crevices in a cedar-dominated forest at Sand Point, Bayfield County (1980). The latter locality could not be relocated in 1995, and it is possible that it was also a roadside collection.

Carex pallescens var. *neogaea* often appears to be associated with areas in which mining was important in the past, and apparently requires periodic disturbance to maintain itself.

MINNESOTA. LAKE CO.: 0.5 mi S of Gooseberry Falls State Park, Sec. 28, T54N R9W, along top of first rocky terrace back from rock shore of Lake Superior, in site getting foot traffic at resort, several plants, 27 July 1993, *Myhre 4283* (MIN). ST. LOUIS CO.: Duluth Waterworks, moist spots of meadow border, Lake Superior terrace, Hwy. 61, 22 July 1953, *Lakela 16260* (DUL); 17 July 1953, *Lakela 16198* (DUL); clearing in north shore woods, Duluth waterworks, 29 June 1954, *Lakela 17696* (DUL).

WISCONSIN. ASHLAND CO.: Madeline Island, Big Bay campground area, roadside ditches, Sec. 19, T50N R2W, 16 June 1992, *J-8717*; Madeline Island, common on damp roadsides and brackish meadows, 1917, *Goessl 8247* (MIL); Hwy. 13 just S of Co. X jct., Sec. 8, T43N R2W, 29 July 1996, *J-11993*; Hwy. 77 2.5–3.5 mi E of Mellen, Sec. 3, T44NR2W, 30 July 1996, Judziewicz sight record; Hwy. 77 4 mi E of Mellen, Sec. 35, T45N R2W, 29 July 1996, *Nekola s.n.* (UWGB); Hwy. 13, 3 mi S of Mellen, Sec. 13, T44N R3W, 27 July 1996, *J-11989, N s.n.* (UWGB #24875); Hwy. 13 5 mi S of Mellen, Sec. 25, T44N R3W, 29 July 1996, *J-11991*; E side of Popko Road ca. 0.2 mi S of Hwy. 169, Sec. 14, T45N R2W, 31 July 1996, *J-12003*; Sec. 12, T41N R3W, tip-up mound in second-growth sugar

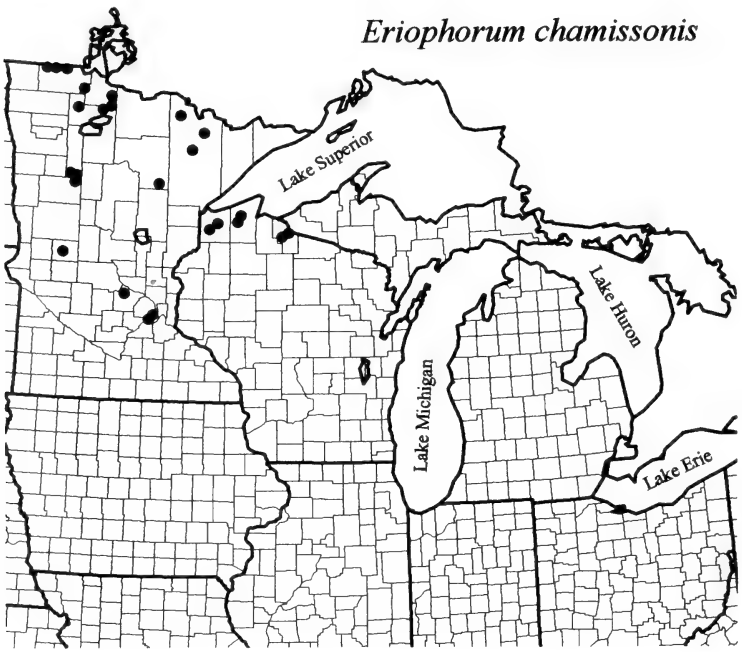
maple stand, 21 July 1992, *Westad s.n.* (WIS). BAYFIELD CO.: Sand Point, Sec. 35, T52N R5W, rock crevices in cedar-dominated forest, 18 July 1980, *Koch 12310* (UWL); Sand Island, on west side of East Bay road, 4 July 1990, *J-6041*, not relocated here on 14 July 1997; Raspberry Bay, Sec. 28, T52N R4W, semi-open disturbed area in sugar maple stand, 27 July 1980, *T.S. & B.A. Cochrane 9135* (WIS). IRON CO.: Sec. 14, T46N R2E, ditch 2 mi N of Hurley on Hwy. 51, 14 June 1975, *Koch 9502* (WIS); Sec. 25, T46N R2E, roadside meadow, hill just S of Hurley on Hwy. 51, 14 June 1975, *Koch 9512* (WIS); Sec. 33, T42N R4E, moist pocket along old logging road, one plant, 11 Aug. 1995, *Clark 856* (WIS); Hwy. 77 1.0 mi E of Iron Belt, Sec. 1, T45N R1E, 30 July 1996, Judziewicz sight record; village of Iron Belt, S side of Severance Street, Sec. 11, T45N R1E, *J-12001*; road just N of Montreal, Sec. 28, T46N R2E, 30 July 1996, *J-12004*; Upson Park Road, Sec. 19, T45N R1E, 30 July 1996, *J-11998*; Hwy. 77 1.5 mi E of Upson, Sec. 16, T45N R1E, 30 July 1996, *J-12000*; cedar swamp 2.5 mi S of Iron Belt, on E side of Island Lake Road, Sec. 24, T45N R1E, 14 July 1996, *J & Nekola 11930* (WIS). MILWAUKEE CO.: Schlitz Audobon Center, Sec. 9–10, T8N R22E, white ash—white birch—basswood forest, 15 July 1997, *E. Zimmerman 499* (WIS). PRICE CO.: Sec. 23–24, T40N R1W, recent specimen in Park Falls herbarium. TAYLOR CO.: Sec. 25, T33N R1W, weedy roadside on east side of FR 106, just W of Mondeaux Flowage; with *Trifolium aureum*, *Geum aleppicum*, *Prunella vulgaris*, *Stellaria graminea* and many other common plants, 4 July 1993, *Fields 326* (WIS). PRICE CO.: Wet pasture neat Park Falls, Sec. 28, T40N R1W, 30 May 1992, *P. Wagner s.n.* (WIS). WASHBURN CO.: Hunt Hill Audobon Sanctuary, 4 mi E of Sarona on Hwy. 53, Sec. 4, T37N R11W, grassy, weedy, transition zone on edge of red oak—red maple forest, 29 July 1992, *T.S. & B.A. Cochrane 12701* (WIS).

3. *Eriophorum chamissonis* C.A. Meyer, rusty cotton-grass (Sedge family, Cyperaceae). Conservation status: Federal, none; Mich., not known from state; Minn., none, dozens of records; Wis., special concern. (Map 3)

This circumboreal cotton-grass is found in Eurasia and northern North America from Alaska south to Oregon, Wyoming, eastern North Dakota, central Minnesota, and northwestern Wisconsin. The following five sites, all discovered by Jeffery Nekola in July 1996, represent the first records for this boreal species in Wisconsin. It is rare in very wet floating bog mats or less commonly in poor fens, mostly along the Lake Superior/Mississippi River drainage divide, at elevations from 1,115–1,705 ft (ca. 500–1,100 ft above Lake Superior). *Eriophorum chamissonis* is known from three counties in North Dakota well west of the coniferous forest zone, and is scattered throughout northern and north-central Minnesota south to the Twin Cities area. Therefore, it is probable that more stations may eventually be found in the northwestern counties of Wisconsin such as Burnett, Washburn, Polk, and Barron, perhaps even in prairie pothole "fens" (perhaps with indicator species such as *Triglochin maritimum* and *Platanthera dilatata*) as well as in coniferous bogs. In two of the Wisconsin sites (Sandrock Bog in Iron County and the Poplar River headwaters in Douglas County), rusty cotton-grass grows in very wet mats on the upslope or ponded sides of bogs whose drainage has been impeded by a road or railroad grade. It might also be expected in the western Upper Peninsula of Michigan.

This is a distinctive cotton-grass. Like the common *Eriophorum spissum*, *E. chamissonis* has only one spikelet per head, but this spikelet is huge—nearly the size of a golf ball when mature. It has a slight tawny or brownish cast, but this is not as noticeable as the manuals or common name indicate (other specimens from the southern edge of the range such as Minnesota also show this white rather than rusty coloration). Also, *E. chamissonis* is rhizomatous, so the stems arise scattered

Map 3



through the bog mat, not in dense clumps as in *E. spissum*. Other technical characters that differentiate *E. chamissonis* from *E. spissum* are the fewer spikelet scales (seven or fewer) and the more conspiciously beaked achenes.

WISCONSIN. BAYFIELD CO.: E side of Eagle Lake, Sec. 3, T46N R8W, boreal fen mat dominated by *Carex lasiocarpa*, *Eleocharis elliptica*, *Menyanthes trifoliata*, and *Myrica gale*, also with *Utricularia intermedia*, *Arethusa bulbosa*, and *Liparis loeselii*, ca. 100 plants in small, cold, shallow puddles, 17 July 1996, *N. s.n.* (UWGB #24816), 19 July, *J-11958* (WIS). DOUGLAS CO.: Erickson Creek headwaters swamp, Sec. 19, T45N R13W, open sphagnous muskeg with scattered small black spruce and tamarack, on SW side of intersection of Co. A and Empire Truck Trail ca. 12 mi W of Gordon, with *Chamaedaphne calyculata*, *Ledum groenlandicum*, *Carex paupercula*, *C. chordorrhiza*, *C. pauciflora*, *Eriophorum virginicum*, *Smilacina trifolia*, and *Vaccinium oxycoccos*, 150 plants, 22 July 1996, *N. s.n.* (UWGB #24834), 24 July, *J-11979* (WIS); Poplar River headwaters conifer swamp, Sec. 10, T46N R12W, very wet sphagnous boggy ditch in fiberoptic cable right-of-way on N side of Bennett Line Road ca. 0.6 mi W of Hwy. 53, 250 plants, with *Andromeda glaucophylla*, *Calla palustris*, *Carex oligosperma*, *C. paupercula*, *Chamaedaphne calyculata*, *Eriophorum virginicum*, *Glyceria borealis*, *Kalmia latifolia*, *Ledum groenlandicum*, *Vaccinium oxycoccos*, discovered by Nekola on 22 July 1996, vouchered on 24 July, *J-11978* (WIS). IRON CO.: Island Lake South Bog, S of intersection of Pleasant Lake and Lake Six Roads, Sec. 36, T44N R1E, very open wet sphagnum mat, ca. 1,000 plants, with *Eriophorum angustifolium*, *E. virginicum*, and *Vaccinium oxycoccos* all common, also *Typha latifolia*, *Glyceria borealis*, *Triadenum fraseri*, *Drosera rotundifolia*, *Calla palustris*, *Carex canescens*, *Platanthera lacera*, *Juncus effusus*, *Potentilla palustris*, *Menyanthes trifoliata*, and *Epilobium leptophyllum*, 15 July 1996, *N s.n.* (UWGB #24871), 17 July 1996, *J-11943* (WIS); Sandrock

Bog, Sec. 5, T44N R3W, open very wet sphagnous bog mat on W side of old RR grade 0.5 mi N of Sandrock Road, ca. 500–1,000 plants, with *Eriophorum tenellum*, *E. virginicum*, *Calla palustris*, *Juncus effusus*, *Vaccinium oxycoccos*, and *Glyceria canadensis*, 15 July 1996, *N s.n.* (UWGB #24868), 17 July 1996, *J-11938* (WIS).

4. *Filipendula ulmaria* (L.) Maxim., queen-of-the-meadow (Rose family, Rosaceae). Conservation status: None; an introduced Eurasian exotic.

Queen-of-the-meadow has the potential to become a troublesome weed of wetlands, as in one boggy inlet of Bibon Lake, Bayfield County, where it is co-dominant at the water's edge with tamarack, sweet gale, tag alder, and giant reed grass. This large (to 1.5 m tall) handsome, perennial also grows in ditches, creekbottoms, and more rarely on wave-splashed sandstone shores. There are apparently no published reports of its naturalization in Michigan and Wisconsin. In Minnesota it is reported only near Duluth (Ownbey & Morley 1991), although Gary Walton (pers. comm. 1997) reports a recent site from south of the Knife River in Lake County, and indicates that is appears to be spreading northeast from Duluth along Hwy. 61. It is possible that queen-of-the-meadow was originally introduced as an ornamental by Finnish-American farmers, as suggested by Olga Lakela's 8 Aug. 1939 collection (*3233*, DUL) from "along fences in fields" at her old family estate in Kestila, Finland.

Minnesota and northwestern Wisconsin sites: **MINNESOTA**. ST. LOUIS CO.: Duluth, large colony at junction of Duluth Iron Range Railroad and Lakewood Road, 18 Aug. 1943, *Lakela 5415* (DUL); Duluth, large colony on Lake Superior terrace, Lakewood Rd. and Hwy. 61, 4 Sept. 1943, *Lakela 5481* (DUL); Duluth Waterworks, shore of Lake Superior, 8 Aug. 1942, *Lakela 5126* (DUL); border of *Alnus* swamp on Hwy. 53 1 mi N of Jackson's School, 21 Aug. 1943, *Lakela 5426* (DUL).

WISCONSIN. BAYFIELD CO.: NW1/4 NE1/4 Sec. 35, T50N R9W [Jardine Creek just N of Hwy. 13], low brushy area dominated by *Alnus* and sedges, along creek and roadside, 29 July 1981, *Alverson 1816* (WIS), relocated on 16 Aug. 1995, 100s of plants on west bank of creek N of Hwy. 13 bridge, ca. 3 mi W of Port Wing, with tag alders, *Scirpus* sp., and bluejoint, *J-11590*; Bibon Lake, Port Wing bog, SW1/4 SE1/4 Sec. 20 and N1/2 of NE1/4 Sec. 29, T50N R8W, common and thoroughly naturalized along boggy side slough, ca. 1,000 flowering plants, with tamarack, sweet gale, tag alder, and *Phragmites australis*, 16 Aug. 1995, *J-11584*; SW1/4 NW1/4 SW1/4 Sec. 20, T50N R8W, Quarry Point just west of Port Wing, one plant noted on wave-splashed sandstone ledge, 16 Aug. 1995, Judziewicz sight record. DOUGLAS CO.: Junction of Hwy. 2 and Co. U [near Amnicon Falls State Park], meadow opening, low ravines and somewhat shaded, Sec. 32, T48N R12W, 21 July 1981, *Koch 13039* (UWL); City of Superior, SW1/4 NW1/4 Sec. 3, T48N R13W, Moccasin Mike Road 0.5 mi E of Hwy 2, common in ditch on south side, 50 plants with *Calamagrostis canadensis*, *Carex stricta*, *Typha* sp., and *Geum aleppicum*, 3 Aug. 1995, *J-11493*; persisting in vacant lot on W side of Co. Hwy. H, SE1/4 NE1/4 Sec. 26, T48N R10W, 3 Aug. 1996, *Clark 1064* (WIS). TAYLOR CO.: Medford mill pond, abundant in moist meadow; also along a railroad track north of Medford, Sec. 27, T31N R1E, 9 Aug. 1993, *Fields 536* (WIS).

5. *Gnaphalium sylvaticum* L., woodland cudweed (Composite family, Compositae). Conservation status: Federal, none; Mich., none; Minn., not known from state; Wis., special concern.

Woodland cudweed is a slender, shade-loving circumboreal species found in North America south to northern Wisconsin, northern Michigan, northern New York (one site) and northern New England (Penskar 1992). In New England it is known from one station each in Vermont and New Hampshire, and many in

Maine. The species is extremely rare in the Midwest, but perhaps overlooked because of its late flowering season (mostly August and September) and frail appearance. In Michigan, it is known from three colonies totalling 225 plants in second-growth sugar maple-hemlock-yellow birch woods on Grand Island, Alger County, where it was discovered by Don Henson in 1991 (Penskar 1992, Voss 1996). Here woodland cudweed occurs on woodland edges along recently disturbed logging roads, suggesting that the species may be adapted to forest gaps and may have a long life in soil seedbanks. The first and so far only Wisconsin station, on Outer Island, Ashland County (Sec. 24, T53N R1W), was discovered by William Fraundorf on 13 September 1978 and reported by Freckman & Fraundorf (1981). It occupies much the same habitat as the Michigan populations; Freckman & Fraundorf gave the habitat as a moist, muddy trailside at the edge of an upland woods and margin of a beaver pond. After unsuccessful searches in June 1991 and July 1992, the population was finally relocated on 16 September 1993, when 66 flowering and fruiting plants were found along a hiking trail through second-growth red maple, white birch, and balsam fir just south of the beaver pond. However, a return visit on 28 August 1996 revealed only four plants (Judziewicz 1996). If population trends continue it appears that woodland cudweed could become extinct in Wisconsin in the near future. However, it may persist in the seedbank, and is inconspicuous so there may be undetected populations. It is also possible that the Outer Island population were inadvertently introduced during intensive logging operations in the 1940s through early 1960s.

6. *Juncus ensifolius* Wikstrom, iris-leaved rush (Rush family, Juncaceae). Conservation status: None, an exotic introduced from western North America.

Iris-leaved rush is native from Alaska and Saskatchewan south to California, Arizona, Colorado, and the Black Hills of South Dakota, with disjunct (and presumably adventive) populations in Ontario (one site on James Bay), along the Delaware River in New York, and in northwestern Wisconsin. Gleason & Cronquist (1991) give the species as "disjunct" in Wisconsin, but all sites are from ditches and there is no reason to suppose that the species is native here.

This rush was first discovered in the Midwest in 1971 when Hugh H. Iltis collected it along Hwy. 13 south of Mellen in Ashland County. He reported it in 1974 as "common [along Hwy. 13] for 2–7 mi south of Mellen" and this is essentially its status in 1996, although a few sites are known from east and southeast of Mellen along Hwy. 77.

Iris-leaved rush prefers moist, grassy, open ditches, often with basaltic bedrock near the surface. In such sites it often forms prominent stands that are easily picked out from a moving car by the tall, dark brown inflorescences. Frequent associates are *Carex pallescens* var. *neogaea*, *C. vulpinoidea*, *C. castanea*, *Onoclea sensibilis*, *Platanthera lacera*, goldenrods and asters, and many exotics such as *Chrysanthemum leucanthemum*, *Prunella vulgaris*, *Trifolium* species, *Lotus corniculatus*, and *Plantago lanceolata*.

WISCONSIN. ASHLAND CO.: Along Hwy. 13 just S of Mellen, Sec. 7, T44N R2W, 7 Aug. 1971, *Iltis 26312* (WIS), 22 Sept. 1974, *Iltis 27727* (WIS); 2.7 mi S of Mellen, Sec. 13, T44N R3W, 27 July 1996, *J-11990, N s.n.* (UWGB #24879); 4.5 mi S of Mellen, Sec. 25, T44N R3W, 29 July 1996 Judziewicz sight record; 6.5 mi S of Mellen, Sec. 6, T43N R2W,

29 July 1996, Judziewicz sight record; 8 mi S of Mellen, Sec. 7, T43N R2W, 29 July 1996 Judziewicz sight record; ditch at wayside of Hwy. 13 on continental divide 3 mi S of Morse cut-off, Sec. 21, T43N R2W, 29 July 1996, *J-11994*; Co. MM ditch just SW of jct. with Sackett Road, Sec. 17, T44N R2W, 29 July 1996, *J-11997* (WIS); ditch on N side of Hwy. 77 just W of jct. with Co. MM, ca. 4 mi E of Mellen, Sec. 35, T45N R2W, Sec. 35, 15 July 1996, *N. s.n.* (UWGB #24880).

7. *Juncus vaseyi* Engelm., Vasey's rush (Rush family, Juncaceae). Federal status: none; Mich., theatened; Minn., no status, although listed as "sensitive" in the Chippewa and Superior National Forests; Wis., special concern.

This inconspicuous rush is spottily distributed from British Columbia to Nova Scotia, south to Colorado, Iowa, Indiana, and New York. It was reputed to be nowhere common in its range, but 1995 field work on the Lake Superior clay plain in Douglas County showed it to be widespread in disturbed areas in and surrounding the city of Superior, becoming less common to the east (one Bayfield County site was documented) and inland (no site is more than 6 miles from Lake Superior). In all, several dozen new sites were documented. Vasey's rush occurs in grassy ditches, old fields, and brushy cleared areas in heavy red clay soils. It generally occurs in sites at the stage of old-field succession that has a maximum diversity of herbaceous plants such as asters and goldenrods. Common associates are *Solidago canadensis*, *S. uliginosa*, *S. gigantea*, *Euthamia graminifolia*, *Carex castanea*, *C. vulpinoidea*, *Salix discolor*, *Valeriana officinalis*, *Agrostis gigantea*, *Equisetum arvense*, *Juncus effusus*, *Calamagrostis canadensis*, *Aster simplex*, *A. puniceus*, *A. umbellatus*, *Scirpus cyperinus*, *Carex lacustris*, *Phleum pratense*, *Bromus ciliatus*, *Fragaria virginiana*, and *Lysimachia ciliata*.

Representative populations of Wisconsin's Lake Superior drainage basin (several dozen 1995 sites omitted): BAYFIELD CO.: Sec. 34, T49N R9W, Town of Orienta, Wyat D. Judziewicz tract, 31 July 1993, *J-10481*, only a few plants in old field near Resch Creek, relocated 20 Sept. 1995 by Judziewicz. DOUGLAS CO.: Near Allouez Bay and Wisconsin Point, 24 July 1897, *Cheney 7694* (WIS); Amnicon Falls State Park: moist area of meadow, 25–30 plants, 31 July 1969, *Koch 6087* (WIS); powerline right-of-way, 10–20 plants, Sec. 29, T48N R12W, Oct. 1988, sight record by E.J. Epstein; 1.6 mi E of South Range on Co. Hwy. A, Sec. 1, T47N R14E, forb-rich old field, 10 Aug. 1996, *N & North s.n.* (UWGB #24794); 0.5 mi E of South Range on Co. Hwy. C, Sec. 27, T48N R12E, forb-rich old field, 10 Aug. 1996, *N & North s.n.* (UWGB #24882); Peyton Marsh, Sec. 8, T48N R13W, 100 plants, 7 Sept. 1995, *J-11677*; Boylston Junction Marsh, Sec. 22, T48N R14W, acid ditch on W side of Hwy 35 0.5 mi N of Boylston Junction, 10 plants, 11 Sept. 1995, *J-11683*; Clevedon Road field, Brule River State Forest, Sec. 15, T49N R10W, 21 Sept. 1995, *J-11717*; Pokegama Radio Tower Marsh, Sec. 8, T48N R14W, 1,000–3,000 plants, perhaps the largest population in the state, 31 Aug. 1995, *J-11660*; Hill Avenue ditch by Oil Refinery, Sec. 35, T49N R14W, 5 July 1995, 100s of plants, *J-11384*.

8. *Listera auriculata* Wiegand, auricled twayblade (Orchid family, Orchidaceae). Conservation status: Federal status, none; Mich., special concern; Minn., none, but proposed endangered; Wis., endangered.

In Wisconsin, this small orchid is rare in alluvial sand under streamside alder thickets near creek mouths (Case 1987) on the east side of Chequamegon Bay, Bayfield County. Searches for historical sites on the northwest side of the Bayfield Peninsula have been unsuccessful. Presently it grows at just two sites covering a total area of just a few square meters (Table 1). Auricled twayblade may

TABLE 1. Population trends in *Listera auriculata* at extant Wisconsin sites.

Year	Observer	Sioux River Slough	Pikes Creek
1981	W.S. Alverson	15 plants	Unknown
1992	M. Van Stappen	20 plants	75 plants
1995	E.J. Judziewicz	50 plants	178 plants (121 fertile)
1996	E.J. Judziewicz	38 plants (17 fertile)	114 plants (67 fertile)

be the rarest orchid in Wisconsin, and more information is needed on its population biology.

WISCONSIN: BAYFIELD: Near Herbster (Cranberry River), Sec. 4 or 8, T50N R7W, 7 July 1897, *Cheney 6851* (WIS), not relocated since; Cornucopia (Siskiwit River), T51N R6W, 6 Aug. 1923, *Davis s.n.* (WIS), 9 July 1930, *Fuller & Staffeld 3820* (MIL), 10 July 1938, *Curtis 38-38* (WIS), not relocated since; Barksdale [on Boyd or Bono Creek], Sec. 24, T48N R5W, 8 July 1938, *Curtis 38–39* (WIS), not relocated since; Pikes Creek, T50N R4W, in 1992, M. Van Stappen sight record, visited in 1995–1996 by Judziewicz (see Table 1); Sioux River Slough, T49N R4W, 18 July 1981, *Alverson s.n.* (WIS), revisited in 1992 by M. Van Stappen and in 1995 and 1996 by Judziewicz (see Table 1).

9. *Listera convallarioides* (Swartz) Torrey, Broad-lipped twayblade (Orchid family, Orchidaceae). Conservation status: Federal, none; Mich., none; Minn.: none, but proposed special concern; Wis., threatened. (Map 4)

This small twayblade ranges from Alaska to Newfoundland south to montane Arizona, northern Minnesota, northern Wisconsin, northern Michigan, and montane North Carolina. In Wisconsin it is known only from three (Bayfield, Ashland, and Iron) of the four counties bordering Lake Superior. It is restricted to mesic, ravine bottom forests on Oak Island and on the tip of the Bayfield Peninsula from Little Sand Bay to Frog Bay. There are old records from the Penokee Range in Iron County, but these have not been relocated. Broad-lipped twayblade grows in rich soil of wooded ravine bottoms and seeping, shaded slopes. Common tree associates were hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), white cedar (*Thuja occidentalis*), and birches (*B. allegheniensis* and *B. papyrifera*). Mountain maple (*Acer spicatum*) is a common shrubby associate; common herbaceous associates include the rare drooping sedge (*Carex prasina*), the uncommon *C. scabrata*, *Circaea alpina*, *Aster macrophyllus*, *Clintonia borealis*, *Maianthemum canadense*, *Athyrium angustum*, *Dryopteris carthusiana* and *D. intermedia*, *Lycopodium lucidulum*, *Streptopus amplexifolius*, *Viola cucullata*, *Mitella nuda*, and *Osmorhiza chilensis*.

WISCONSIN. ASHLAND CO.: Oak Island, ravines in all drainages; first collection in 1917, *Goessl 7935* (WIS). Common in 1992 and 1996, with at least 1,000 plants in many populations (Judziewicz 1996). BAYFIELD CO.: Ravines in vicinity of Little Sand Bay, Sec. 32–33, T52N R4W and Sec. 6, T52N R5W, 17 July 1974, *Koch 8575* (UWL); 2,000–3,000 plants in 1992 and 1996 (Judziewicz 1996); Raspberry Point, T51N R4W, also T51N R3W, July 1974 (W.E. Tans) and August 1995 (Judziewicz) sight records; T51N R4W, head of deep ravine in second growth sugar maple forest, in muddy mossy level ravine bottom head in shade, 20 plants, 11 Aug. 1996, Judziewicz sight record; T52N R4W, ravines northeast of Raspberry Bay, under 6–16″ white cedar, yellow birch, hemlock, and sugar

maple, 8 July 1996, *J-11896*; ravines from Raspberry Point to Frog Bay, T51N R3/4W; rich mesic ravines through second growth sugar maple, hemlock stands, at least 2,000 plants, 3–4, 10 July 1996, *J-11889, 11891-11892*. IRON CO.: Between Pence and Montreal on Hwy. 77, 6 July 1932, *Knowlton 72199* (MIL), not relocated in 1996; Penokee Range, Sept. 1881, *Monroe 9662* (MIL); Lakeshore, Montreal River to Trout Stream [=Bad River], 21 July 1896, *Cheney 5158* (WIS), not relocated in 1995–1996; Lower 2 mi of Montreal River, 20 July 1896, *Cheney 5104* (WIS), not relocated in 1995–1996.

10. *Lonicera involucrata* (Richardson) Banks, involucred honeysuckle (Honeysuckle family, Caprifoliaceae). Conservation status: Federal, none; Mich., threatened; Minn., not known from state; Wis., endangered.

This showy-fruiting, tropical-looking shrub is found from Alaska south to California, New Mexico, Wisconsin, and Michigan. In Michigan there is one old record from Clifton in the Keweenaw Peninsula (Voss 1996), and over 30 sites from Isle Royale (Judziewicz 1995), where the favored habitat is in partial shade in rich soil at the margins of alder thickets and open cedar swamps. The only known Wisconsin site, discovered in 1897, was not relocated until 1996. The most common associates were mature tamarack (*Larix laricina*), tag alder (*Alnus incana* subsp. *rugosa*), *Calamagrostis canadensis*, and *Calla palustris*; others were *Carex brunnescens*, *C. canescens*, *C. crinita*, *C. disperma*, *Ribes triste*, *Potentilla palustris*, *Sium suave*, *Galium tinctorium*, *Rubus pubescens*, *Caltha palustris*, *Aster puniceus*, and *Lycopus uniflorus*. Deer browsing appeared to be a serious problem at the Port Wing site. In July 1996, water levels were higher, and several plants were relocated but had not flowered or fruited.

BAYFIELD CO.: Port Wing, 9-11 July 1897, *Cheney 7055*, *7169*, and *7171* (all WIS), relocated on 15 June 1995, in old growth tamarack swamp S of Bibon Lake, Sec. 29, T50N R8W, eight scattered clones, mostly in very wet, degraded aldery SE part of swamp, each clone 1–5 m in diameter with 10–60 (mean ca. 25) stems, stems 15–70 (–100) cm tall, only a few with flowers, and no fruits noted during a visit of 21 Aug. 1995, *J-11237*.

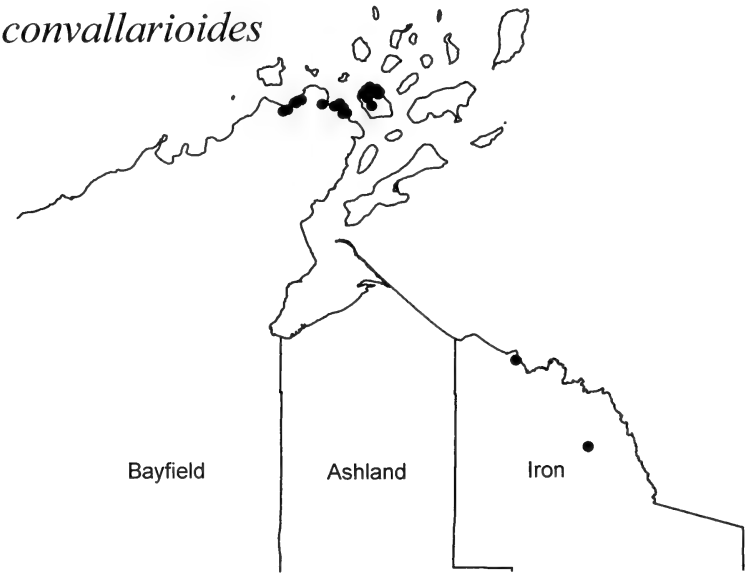
11. *Lycopodium selago* L., fir clubmoss (Clubmoss family, Lycopodiaceae). Conservation status: Federal, none; Mich., special concern; Minn., none; Wis., special concern. (Map 5)

This small, circumpolar clubmoss is found in the New World from Alaska to Greenland, south to Ontario (Given & Soper 1981 map), Minnesota, Wisconsin (Peck & Taylor 1980), Michigan, North Carolina, and New York. Field work in 1995-1996 revealed a number of new stations in Wisconsin, mostly on mossy, seeping wave-splashed sandstone cliffs and ledges on Lake Superior, some of which had been very thoroughly searched in 1991-1992. There is also a new inland station in a conifer swamp, discovered by Andy Clark in 1996. On the other hand, several recent historical sites with precise locality data could not be relocated. All this may indicate that colonies are short-lived and rely on the dynamics of natural disturbance to maintain themselves. In Wisconsin, typical associates on sandstone ledges are *Trisetum spicatum*, *Primula mistassinica*, *Fragaria virginiana*, *Solidago hispida*, *Agrostis scabra*, and alders (*Alnus incana* subsp. *rugosa* and *A. viridis* subsp. *crispa*).

WISCONSIN. ASHLAND CO.: Hermit Island, lakeside boulder at north tip, in 1992, *J-9476*; Devils Island, SE side, in shade of *Cornus stolonifera* and *Alnus viridis* subsp. *crispa*

Map 4

Listera convallarioides



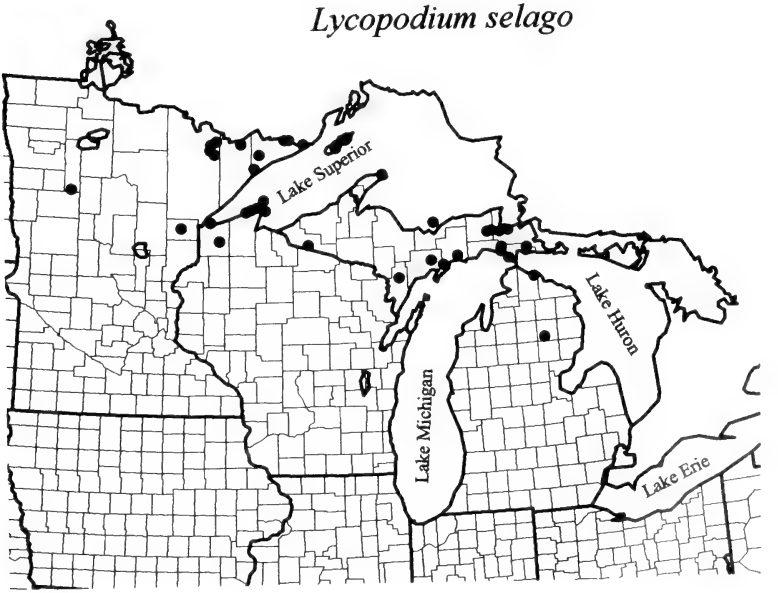
on wet mossy sandstone at edge of wave-splash pool, 22 June 1996, *J-11804*. BAYFIELD CO.: Little Sand Bay Road, Sec. 32, T52N R4W, Sec. 32, N side of road in acid, sphagnous ditch, 1977, *Taylor 4545* (MIL); not relocated during several searches from 1991–1997; Roman Point, Sec. 29, T51N R6W, W-facing sandstone cliff 4–6 m above Lake, with mosses, *Potentilla tridentata*, and *Solidago hispida*, under white birch stand, 28 June 1996, *J-12149*; Squaw Bay cliffs, Sec. 8 and 18, T51N R5W, seeping wet cold shaded sandstone cliffs and shelves 2–8 m above Lake Superior, with *Primula mistassinica*, *Scirpus hudsonianus*, and many mosses, 28 June 1996, Judziewicz & T. Gerstenberger sight record (plants inaccessible); Point Detour cliffs, T52N R4W, on shaded mossy clayey sandstone slope with strawberry, orange hawkweed, *Anaphalis margaritacea*, violets, *Gaultheria hispidula*, and seedling maple, cedar, and fir, also on 45° N-facing slope in wet, shaded, clayey sand at base of cliff 3 m above Lake, with few associates save *Trisetum spicatum*, 11 July 1996, *J-11397*, *11872*, also a few plants in Sec. 28, *J-11919*; Eagle Bay cliffs, T52N R4W, moist level mossy sandstone shelf 2 m above Lake, with *Primula mistassinica* and *Trisetum spicatum*, 3 July 1996, *J-11868*; Raspberry Point cliffs, T52N R3W, 75–100 clumps, with 10–50 stems per clump, probably the healthiest population in the state, on moist, shaded, mossy 30–60_ sandstone ledges, 10 July 1996, photograph by Judziewicz. DOUGLAS CO.: Lakeside swale 3/4 mi from tip of Wisconsin Point, 10 April 1985, *Zirngibl s.n.* (SUWS), not relocated in this swale during several searches in 1995–1996; Brule River Divide conifer swamp, Sec. 17, T45N R11W, open swamp of tamarack, black spruce, balsam-fir, white cedar, and black ash with alder, *Ledum groenlandicum*, *Sphagnum* spp., *Lycopodium annotinum*, *Carex disperma*, *C. triperma*, *Linnaea borealis*, *Coptis trifolia*, *Mitella nuda*, and *Osmunda* sp., 1 m diam. colony with 50–100 stems, 25 Sept. 1996, *Clark 1065* (WIS).

12. *Mertensia paniculata* (Ait.) G. Don., northern or tall lungwort (Borage family, Boraginaceae). Conservation status: Federal, Mich., Minn., and Wis.: none. (Map 6)

This "northern bluebells" is found from Alaska and across Canada south to Oregon, Iowa, Wisconsin, and Michigan (but not in New England). Common in northeastern Minnesota, in Wisconsin it is found most commonly in the Lake Superior region, especially in the vicinity of the city of Superior, Douglas County. Farther east and south, it is rare in cedar swamps in the northeastern part of the state, and occurs on one algific talus slope in Grant County in the southwestern part (it is also found on algific talus slopes in Iowa; Pusateri et al. 1993). The species has not, as Cochrane (1975) suggested, turned out to be common in the northern counties of Wisconsin. Northern lungwort has two main habitat preferences in the Lake Superior region. It occurs either in openings in remnant boreal forest dominated by balsam fir, white spruce, and white birch, often on roadsides (the city of Superior area populations are all of this type); or in springy, mucky, mossy seeps dominated by white cedar and other conifers, such as inland sites like McDougal Springs, Sajdak Springs, and Schachte Creek headwaters. Although it is a common plant in the vicinity of the city of Superior, northern lungwort should be considered for special concern status in Wisconsin for several reasons: 1) It has disappeared from many historical sites on the Bayfield Peninsula, although Gary Walton (pers. comm.) reports seeing it in a cedar swamp at Barksdale in 1996. 2) Demographic trends in the few non-Lake Superior stations are unknown. 3) On Isle Royale in 1994, it was seen only at a site that was protected from moose browse—despite the fact that there were many historical collections from the island. This suggests that the other large ungulate in the regional fauna, white-tailed deer, may be having a negative

Map 5

Lycopodium selago



impact on the species. 4) Unlike the white mandarin (*Streptopus amplexifolius*), which has a roughly similar Wisconsin distribution and habitat preference, and is browsed by deer, northern lungwort has no reservoir of populations protected from deer browsing on the Apostle Islands—it does not occur there.

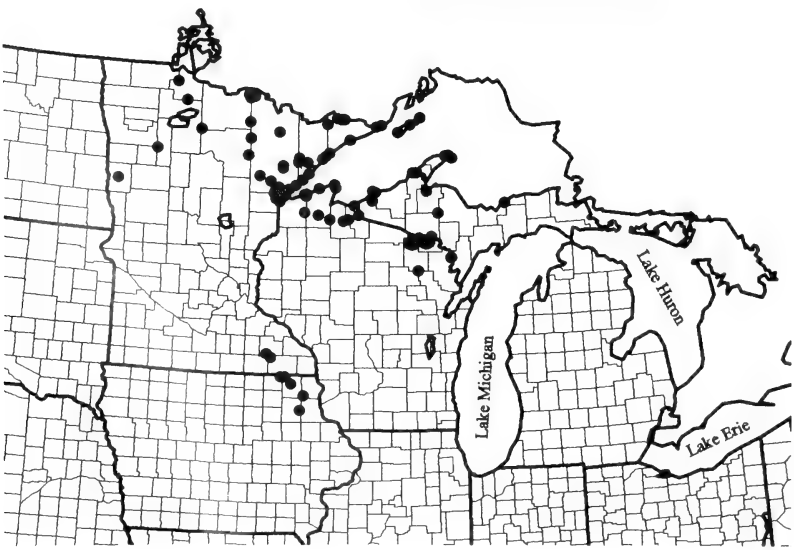
13. *Myriophyllum alterniflorum* DC., delicate or alternate-leaved water-milfoil (Water-milfoil family, Haloragaceae). Federal status: none; Mich., special concern; Minn., no status; Wis., special concern. (Map 7)

This most delicate of Midwestern water-milfoils is also the most northerly ranging, aptly described by Voss (1985) as a "neat, slender plant ... often [with a] sinuous, much-branched stem". It occurs in northern Eurasia and northeastern North America, ranging south to Minnesota, Michigan, New York, and Massachussetts. Minnesota has about a dozen sites in the four northeasternmost counties, Wisconsin about 15 sites, all but one in the northernmost two tiers of counties (plus Walworth County in the south), and Michigan a dozen stations in the counties bordering Lake Superior, plus a half dozen sites on Isle Royale. Delicate water-milfoil occurs inland in clear oligotrophic lakes and is one of the small subset of aquatics that grows in sheltered bays of Lake Superior itself, as on Isle Royale (Lane Cove; Judziewicz 1995) and Port Superior, Bayfield County, Wisconsin (just south of Bayfield). It may be an overlooked species indicative of high water quality.

Wisconsin site discovered during this survey: BAYFIELD CO.: Pikes Bay at Port Superior marina, NE1/4 NW1/4 Sec. 27, T50N R4W, 10 Aug. 1995, ca. 100 plants in ca. 1 m of water, *J-11529*.

Map 6

Mertensia paniculata



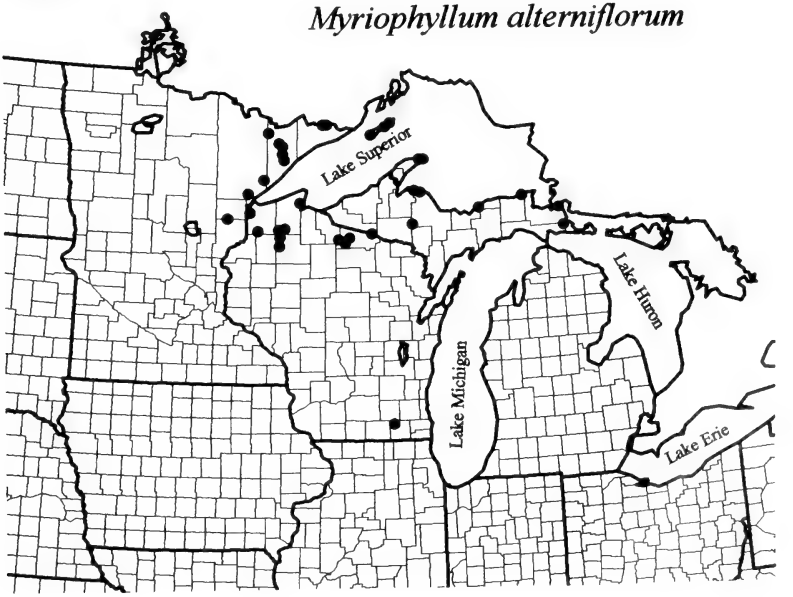
14. *Petasites sagittatus* (Pursh) A. Gray, sweet coltsfoot (Composite family, Compositae). Federal status: none; Mich., threatened; Minn., no status; Wis., threatened. (Map 8)

This handsome perennial with burdock-like leaves is fairly common in Minnesota but quite local in both Wisconsin and Michigan. It occurs from Alaska and Labrador south to Colorado, South Dakota (rare in the Black Hills), and the Lake Superior region. In northwestern Wisconsin, it is locally common in marshes and shrub swamps in the vicinity of Superior (Douglas County) and the Bibon Swamp (Bayfield County), while scattered colonies occur on the Lake Superior clay plain near the Brule and Iron Rivers. Typical habitats are cold, boggy meadows dominated by grasses or sedges such as bluejoint (*Calamagrostis canadensis*) and *Carex lacustris*. While many more stations were found near the city of Superior in 1995, it should be noted that hybridization with the common *P. palmatus* may pose a threat to this species in that area. Many intermediates, presumably the hybrid *P.* ×*vitifolius* E. Greene (Bogle 1968), were noted in the Superior area in 1995. Fortunately, *P.* ×*vitifolius* was not noted in the Brule River, Iron River, and Bibon Swamp populations.

WISCONSIN: BAYFIELD CO.: Tar Paper Alley, in ditch, Sec. 19, T49N R9W, small marshy area, recently logged, a large patch in clay soil, 4 Aug. 1975, *Stackler 75-804* (WIS), relocated on 31 May 1995 by Judziewicz, on E side of road at this spot (Sec. 20), 300–500 plants in a marshy willow thicket; Bibon Swamp area, Sec. 1, T45N R6W, in marsh, June 1980, *Tans 1953* (MIL), also Sec. 1 and 11, T45N R5W, July 1989, in past years, "an infinite number in fruit reported along a nine mile stretch of Hwy 63," in 1980, 250–300 plants in an area 150′ × 100′ in Sec. 1, T45N R6W, on 15 May 1996, the species was found in two areas in the swamp: 1) along west side of Hwy. 63, Sec. 1 and 12, T45N R6W, in ditch and into

Map 7

Myriophyllum alterniflorum



alder/willow thicket with much *Carex lacustris* and *Calamagrostis canadensis*, 500–1,000 plants, and 2) a few plants at the W end of the swamp, Sec. 32, T46N R6W, sight record by Joan Elias in June 1996 in alder/willow thicket with some *Carex lacustris*; ditch on Hwy. 13 2 mi W of Port Wing, Sec. 31, T50N R8W, 27 June 1995, 200–300 plants, Judziewicz sight record; ditch on Clevedon Road, Sec. 21, T49N R10W, 2.7 mi N of Hwy. 13, on W side of road in bluejoint swamp, 500 plants, 2 June 1995, Judziewicz sight record; ditch on Danielson Road, Sec. 8, T48N R10W, 1 June 1995, cattail swamp/sedge meadow on E side of Co. O opposite junction with Danielson Road, 200–300 plants, Judziewicz sight record. DOUGLAS CO.: Superior, 9 June 1930, *Conklin s.n.* (WIS); Bong Airport, many populations found by G. Walton, R. Koch, and P. Monson in 1993–1994; Superior, Tower Avenue wetlands, Sec. 26, T49N R14W, May 1992, R. Hoffmann sight record; W side Pokegama Road 0.2 mi south of Hwy 105, Sec. 8, T48N R14W, 27–29 June 1979, *Alverson 1446* (WIS); culvert under railroad tracks 1/4 mi W of Patzau, Sec. 10, T46N R15W, 18 May 1976, *Stackler 1233* (UWL); Solon Springs, T45N R12W, *Davis s.n.*, 13 Aug. 1915 (WIS); Gordon, T43/44N R11/12W, W end of large swamp north of village on creek bank, 18 Aug. 1929, *Wilson 1854* (WIS), G. Walton relocated it here in 1996; Pokegama Marsh, Sec. 8, 16 and 17, T48N R14W, 31 Aug. 1995, 10,000–50,000 plants, one of the largest sites in the state, Judziewicz and D. Spuhler sight record; Ambridge, Sec. 13, T48N R14W, 22 May 1995, shrub swamp on E side of Hwy. A, 3,000 flowering plants, 21 May 1996, Judziewicz sight record; marsh on E side of Albany Road, Sec. 27, T49N R14W, 5 June 1995, Judziewicz sight record; South Superior, Sec. 2–3, T48N R14W, 5 July 1995, sedge meadow/shrub swamps next to railroad tracks, Judziewicz sight record; marshes/shrub swamps S of Mariner Mall, Superior, Sec. 25, T49N R14W, 1 June 1995, Judziewicz sight record; W side of Hill Ave. west of the oil refinery, Superior, Sec. 26 and 35, T49N R14W, 5 July 1995, Judziewicz sight record; Brule River Road, Sec. 22, T49N R10W, in 1996, sight record by D. Spuhler and A. Clark in 1996. FOREST CO.: Otter Springs swamp, Sec. 24, T36N R13W, wet, sandy roadside adjacent to alder swamp, with *Equisetum* sp., *Carex* sp., *Onoclea sensibilis*, *Thalictrum* sp., and *Ribes lacustre*, 134 fruiting stems, 7 June 1995, *Krueger & Dobberpuhl s.n.* (WIS).

15. *Pinguicula vulgaris* L., butterwort (Bladderwort family, Lentibulariaceae). Conservation status: Federal, none; Mich., special concern; Minn., special concern; Wis., endangered.

Butterwort is a circumboreal species occurring south in North America to Oregon, Ontario (see regional map in Given & Soper, 1981), Minnesota, Wisconsin, Michigan, and northern New England. In Wisconsin, this species is locally common on Devils, Ironwood, Otter, and Outer Islands, Ashland County (Gurnoe, 1981; Judziewicz 1995, 1996; Judziewicz & Koch 1993), where it occurs on north-, northeast-, or northwest-facing sandstone cliffs in small, mossy, seeping fissures or ledges, usually located from 1–8 meters above the lake surface. The Devils and Otter Island sites were discovered by F.C. Lane in 1955, while Judziewicz and ranger Jim Vickery discovered the Outer and Ironwood Island populations in 1991–1992 (Judziewicz 1993, 1996).

Of interest are population trends in this species (Table 2). The large Devils Island population seems stable over the years, while the large Outer Island population is not well known; i.e, the large increase in numbers of plants between 1992 and 1996 is due to more thorough surveys that included the discovery of several new sub-populations. On both of these islands, plants tend to grow in perennially moist seepage joints on shelves of sandstone cliffs.

The decline in the smaller Ironwood and Otter Island populations seems to be real, with many sub-populations disappearing between 1991 and 1996. On these islands, the plants tend to grow on mossy fallen slabs of sandstone moist-

TABLE 2. Population trends in *Pinguicula vulgaris* in the Apostle Islands, Ashland County, Wisconsin.

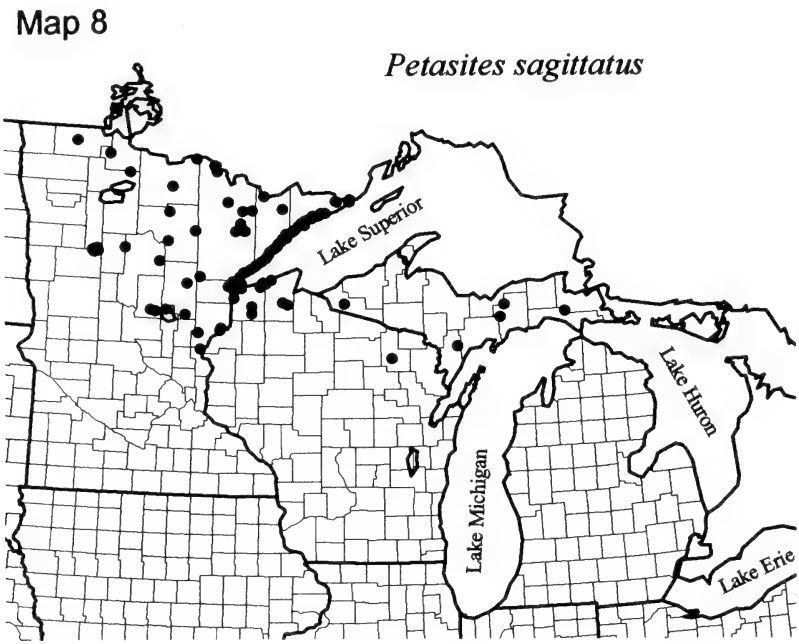
Island	1980–81 (Gurnoe 1981)	1991–96 (Judz. 1993, 1996)	1996	Change, 1991–96
Devils	3,047	4,135	4,713	+ 14%
Ironwood	Unknown	1,065	750	–29%
Otter	1,019	2,022	786	–61%
Outer	Unknown	> 463	2,362	< + 457%
Total	> 4,066	> 7,735	8,611	< + 11%

ened by wave splash, but with no internal seepage. The summer of 1995 was extremely dry, and during the 1996 survey it was noted that the moss mats in which the plants grew were either dead or seriously drought-stressed. So, it is possible that the exceptionally calm (with attendant lack of wave-splash) hot weather of 1995 is responsible for the decline on these islands, while those subpopulations with a constant moisture supply on Devils and Outer did not suffer as badly.

16. *Pyrola minor* L., small shinleaf (Shinleaf family, Pyrolaceae). Conservation status: Federal, none; Mich., none; Minn., special concern; Wis., endangered. (Map 9)

This circumboreal shinleaf is found in North America from Alaska south to California, New Mexico, Minnesota, Wisconsin, Michigan, and northern New England. In Minnesota there are several old records, the most recent dating from 1914 (Coffin & Pfannmuller, 1988), but in 1997 Gary Walton (pers. comm.) rediscovered small shinleaf in the state, finding three new sites in the northeastern part of the state. He reports that typical habitat is the transition zone between upland conifer woods and moist to wet lowland alder thickets. In Michigan, the species is occasional in the northeastern part of Isle Royale, and rare in the Upper Peninsula.

Small shinleaf was long known in Wisconsin only from the 1897 L.S. Cheney collection from Cornucopia, Bayfield County, on the Lake Superior coast. Relocation efforts long centered on boreal and pine forests near the coast, but the species was not relocated. It was a surprise, then, when Jeffery Nekola discovered three populations in mixed alder thicket/conifer swamps inland near the Lake Superior/Mississippi River drainage divide, at elevations of 1,115–1,705 ft (ca. 600–1,100 ft above Lake Superior), in 1996. The preferred habitat is one that was not suspected to harbor rare plant species: tag alder thickets (*Alnus incana* subsp. *rugosa*), more specifically those mixed with a mossy but not necessarily sphagnous understory and an overstory of scattered mature tamarack or less commonly black spruce and white cedar. Frequent associates are other shinleafs (*Pyrola elliptica* and *P. secunda*), *Viola pallens*, *Smilacina trifolia*, *Carex trisperma*, *C. disperma*, *C. leptalea*, *Vaccinium oxycoccos*, *Cornus canadensis*, *Platanthera hyperborea*, *Listera cordata*, *Lycopus uniflorus*, *Gaultheria hispidula*, *Calla palustris*, *Caltha palustris*, *Salix pedicellaris*, *Betula pumila*, *Coptis trifolia*, *Rubus pubescens*, *Trientalis borealis*, *Campanula aparinoides*, *Ledum groen-*



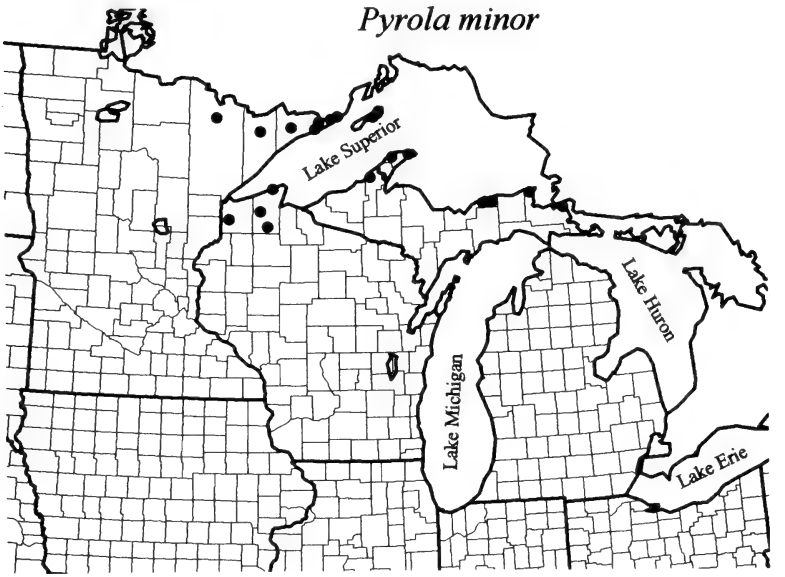
landicum, *Calamagrostis canadensis*, and *Glyceria canadensis*. Specifically, the preferred microhabitat is the bottom and lower sides of small depressions. Colonies are often small, with only a dozen or so plants scattered in an area a meter or two in diameter. These discoveries suggest that *Pyrola minor* may be found in similar sites in Minnesota and Michigan.

WISCONSIN. BAYFIELD CO.: Cornucopia, T51N R6W, 1 July 1897, *Cheney 6647* (WIS), not relocated in 1980–1981 and 1995–1996; Sugarbush Lake alder/conifer swamp, Sec. 26, T44N R7W, in deep sphagnous tamarack/tag alder swamp with bog birch, in cold, wet depressions, 200 plants (25 in fruit), 17 and 19 July 1996, *N s.n.* (UWGB #24841, 24849); E side of Eagle Lake, in tag alder thicket at edge of boreal fen, Sec. 4, T46N R8W, ca. 10 mi S of Iron River, 60 plants (10 in flower), 17 July 1996, *N s.n.* (UWGB #24853), 19 July 1996, *J-11957*. DOUGLAS CO.: Bear Creek headwaters conifer swamp along Summit Fire Tower Road, Sec. 23, T45N R14W, 4 mi E of Moose Jct. on Summit Tower Road, in black spruce/tamarack/alder stand S of road, 63 plants (8 fertile) in area 2 m in diameter, 22 July 1996, *N s.n.* (UWGB #24796), 2 Aug. 1996, *J-12013*.

17. *Ranunculus lapponicus* L., Lapland buttercup (Buttercup family, Ranunculaceae). Conservation status: Federal, none; Mich., threatened; Minn., special concern; Wis., endangered. (Map 10)

This little buttercup bears a striking vegetative resemblance to goldthread (*Coptis trifolia*), and even the flower is reminiscent, but is yellow rather than white. Lapland buttercup is a circumboreal species found south (Given & Soper 1981, map) to northern Minnesota, northern Wisconsin, northern Michigan, and northern Maine. Coffin & Pfannmuller (1988) give ten sites for Minnesota, plus a few new ones reported by Gary Walton (pers. comm., 1997). Michigan Natur-

Map 9



al Features Inventory files give three sites in Delta, Chippewa, and Mackinac Counties. In all cases the habitat is in deep, cold, mossy white cedar swamps. The first two Wisconsin records were found in just such habitats along the Brule and St. Croix Rivers by Chel Anderson in 1994.

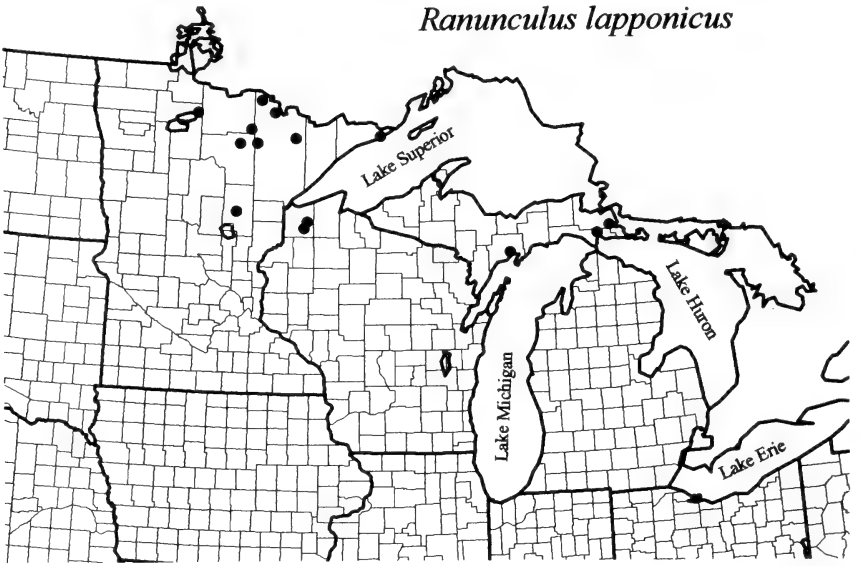
DOUGLAS CO.: Stone Chimney cedar swamp, Sec. 2, T45N R11W and/or Sec. 35, T46N R11W, 29 July 1994, *Anderson s.n.*, 24 June 1995, E.J. Epstein sight record, 25 June 1995, *J-11327*, 200 plants in seeping, mossy (but not very sphagnous) old growth cedar swamp on Brule River, with *Coptis trifolia*, *Ledum groenlandicum*, *Carex vaginata*, *C. disperma*, *C. trisperma*, *C. leptalea*, *Gaultheria hispidula*, *Mitella nuda*, and *Calypso bulbosa*; St. Croix River cedar swamp on E side of river S of Lower Ox Lake, Sec. 8 and 17, T44N R11W, 100+ plants in 6 square meter area in white cedar, balsam-fir, black spruce swamp, 2 July 1994, *Anderson & Lake s.n.* (WIS).

18. *Senecio congestus* (R. Br.) DC., marsh fleabane (Composite family, Compositae). Conservation status: Federal, none; Mich., extipated; Minn., no status, common; Wis., special concern (perhaps extirpated). (Map 11)

This large, conspicuous fleabane or ragwort (resembling *Erechtites hieracifolia* but with yellow instead of white ray flowers) has a circumpolar to circumboreal distribution, ranging south to British Columbia, Alberta, North Dakota, Iowa, Wisconsin (Barkley 1963), Michigan (one historical site), Ontario (Given & Soper 1981 map), Quebec, and Labrador.

Although its common name implies that this is a species of marshes, nearly all Wisconsin collection data are vague. However, even this lack of information may offer hints about the species' habitat preferences. It may imply that the col-

Map 10



lections were made in disturbed, human-modified habitats that collectors found hard to characterize in the terse language of collection labels typical of the early 20th century. The species occurs nearly throughout Minnesota (Ownbey & Morley 1991), where Welby Smith (pers. comm., 1997) reports it from "open, sunny, grassy sites" in habitats that are "not pristine." Iowa collections all predate 1950 and are reported as having occurred in "prairie bogs", forming dense stands on marsh or pond bottoms for a few years, and then disappearing. Marsh fleabane is known in Michigan only from a single collection made in 1934 on the shore of Lake Michigan in Emmet County (E.G. Voss, 28 February 1997 pers. comm.), and not relocated in searches by Voss.

In Wisconsin, marsh fleabane really must be rare or extirpated, because it is a large distinctive composite that would be difficult for even the most casual collector to overlook.

Wisconsin: BAYFIELD CO.: Port Wing (T50N R8W) to Orienta, 14 July 1897, *Cheney 7321* (WIS), site was not relocated in 1995–1996 in spite of searches at such likely sites as the marshes at the mouths of the Brule and Iron Rivers, the Port Wing bog complex, and wet roadside ditches along Hwy. 13; near Drummond, (Sec. 32–33, T45N R7W), 29 June 1896, *Cheney 4341* (WIS), a muskeg on the north side of town was searched without success for this species in Aug. 1996. DOOR CO.: Jack Fish Shoal, T31N R27E, 15 June 1935, *Fassett s.n.* (WIS); this site was searched without success for this species on 6 May 1998. DOUGLAS CO.: "Lake Superior region, near La Chapelle" [see Rhodora 47: 256. 1945; this the type specimen and locality for variety *tonsus* Fernald], 16 July 1897, *Cheney 7419* (holotype, GH!, isotypes, MIL!, WIS!) ["La Chapelle" was a tavern/inn run by John La Chapelle on the old stage road from Superior to Ashland, on the banks of the Brule River about 0.7 mi S of the site of the present Co. Hwy. FF bridge (Jerrard 1956), Sec. 23, T48N R10W]; city of

Superior docks, Northwest Hanna Fuel Dock No. 1, sandy beach and adjacent shallow water on E side of coal yard, plant three ft tall in shallow water, probably Sec. 29, T49N R13W, 23 July 1960, *Monson 4126* (UWL, DUL), this or a site nearby was searched in June 1995, and it was not relocated. ONEIDA CO.: Three Lakes (probably Sec. 6 or 7, T38N R11E), 24 June 1898, *Wadmond s.n.* (MIN). POLK CO.: Bog along E shore of Cedar Lake, Wisconsin" (Note by W.S. Alverson: "Could be Sec. 26, T32N R18W at NE end of lake, but *not* in Sec. 35; more likely in Sec. 2, T31N R18W at SE end of lake in St. Croix Co."), 11 June 1937, *Moore 10033* (MIN). ST. CROIX CO. [*sic*, for PIERCE CO., probably Sec. 12 or 14, T27N R20W], bluffs near mouth of Kinnickinnic River, 2 June 1935, *Fassett s.n.* (WIS), this site searched without success by Judziewicz in Aug. 1989 and May 1993. SAWYER CO.: Hayward [T41N R9W], July–August 1926, *Gilbert & Gilbert s.n.* (WIS). COUNTY UNKNOWN [probably SAUK CO.]: "Devil's Lake, Wis." [note on sheet by J.H. Zimmerman: "probably the Devils Lake at Webster, Burnett Co., or SE of Spooner, Washburn Co. Not Sauk Co."], 30 May 1896, *Cheney s.n.* (WIS) [But can the possibility of Sauk County be dismissed? Devils Lake, Sauk County was a favorite field destination for Cheney and his taxonomy classes. *Senecio congestus* was collected on a Kinnickinic River bluff near the St. Croix River, and occurs on algific talus slopes in Iowa (J. Nekola pers. comm.), so its historic occurrence on cool-air draining quartzite talus such as occurs on the East Bluff of Devils Lake is not impossible. The species is occasional in prairies nearly throughout Minnesota. Devils Lake, Sauk County is a well-known refugium for northern species.]

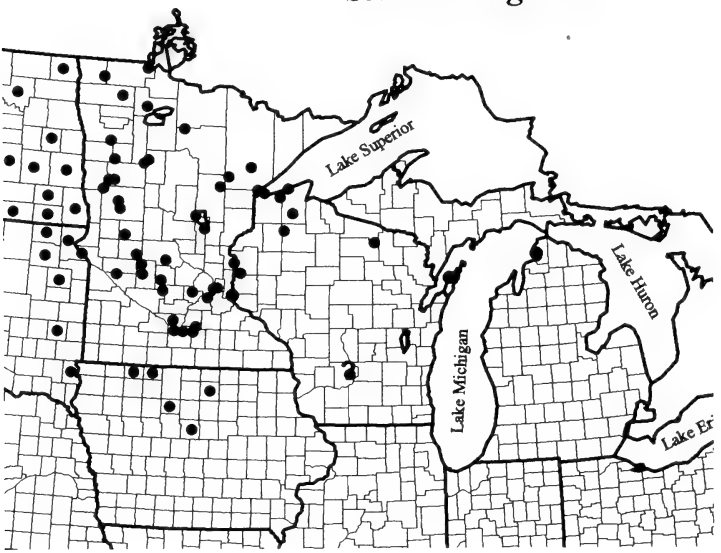
19. *Streptopus amplexifolius* (L.) DC., white mandarin (Lily family, Liliaceae). Conservation status: Federal, none; Mich., none; Minn., none; Wis., special concern. (Map 12)

White mandarin grows from Alaska to Greenland, south to Arizona, South Dakota, northern Minnesota, northern Wisconsin, northern Michigan, New England, and in the Appalachian Mountains to North Carolina. In Wisconsin, this handsome species is widespread on the Apostle Islands, especially the larger islands lacking past or present deer populations, such as Outer, Sand, and Stockton Islands. Transect data suggest populations in the tens of thousands on each of these three islands. On islands with large deer populations, such as Madeline, and on the Wisconsin mainland it is much less common. It is still occasional in rich mesic ravines near the coast on the Bayfield Peninsula, but most populations either 1) are small and show considerable deer-browse damage or 2) are *very* small (one or a few individuals) and occur in sites inaccessible to deer (steep ravine bottoms, or on tall fallen boulders in shaded canyons). Many collections were made inland in the Penokee Range in the 1920s and 1930s, but in spite of intensive collecting in the past few years, only a few small extant populations have been documented there. It is likely that there are less than 1,000 individuals on the Wisconsin mainland, compared with over 100,000 on the Apostle Islands. There are also a few records of this species from Door County, Wisconsin. In Minnesota, Ownbey & Morley (1991) map many occurrences near the Lake Superior shoreline, but Gary Walton (pers. comm.) reports it as uncommon in that state. Don Henson (pers. comm.) notes that it is rare in the Upper Peninsula of Michigan, and states that "deer will climb for it!"

White mandarin is characteristic of rich, well-drained upland woods, often near large stands of sugar maple or hemlocks. It is also locally frequent in rich ravine bottoms. The species is not colonial; seldom does one find more than a few plants growing close together. Common herbaceous associates include *Osmorhiza chilensis*, *Trillium cernuum*, *Panax trifolius*, as well as ubiquitous

Map 11

Senecio congestus



understory species such as *Clintonia borealis*, *Maianthemum canadense*, and *Trientalis borealis*.

WISCONSIN. ASHLAND CO.: Occasional on nearly all the Apostle Islands (Judziewicz & Koch 1993) except Madeline, where rare (6 Aug. 1931, *Fuller 4433*, MIL); at various sites in the Penokee Range by Fassett in the 1920s and 1930s, perhaps last seen at following site: S of Eagle's Peak near Mellen, Sec. 11, T44N R2W, wet sedgy ground near spring-fed stream, in red maple-white cedar woods with birch, gooseberry, *Mertensia paniculata*, and *S. roseus*, 7 Aug. 1971, *Schwarzmeier s.n.* (WIS); Morgan Creek area, Sec. 29–30, T45N R4W, 17 Sept. 1997, M. Brzeskiewicz sight record. BAYFIELD CO.: Lenawee, shady ravine, 6 Aug. 1917, *Goessl 8285* (MIL); gorge of Larson Creek at Twin Falls Park, Port Wing, Sec. 32, T50N R8W, in 1970s, *Koch 10204* (UWL), not relocated here in June 1995 by Judziewicz; Little Sand Bay, in 1962, *Iltis & Kawano 20505* (WIS), still present here, 1991–1996; Sand Island, common in 1992 (Judziewicz & Koch 1993); deep dry ravine (with second growth hardwoods) in lakeshore cliffs between Port Wing and Herbster, Sec. 12, T50N R8W, 3 plants, 31 May 1995, Judziewicz sight record; Siskiwit River at Siskiwit Falls, Cornucopia, Sec. 34, T51N R6W, 4 plants in gorge, June 1995, Judziewicz sight record; Sec. 12, T51N R5W, 6–9″ birch, maple and aspen stand in ravine bottom in cut-over county forest, 2 plants, 11 Aug. 1996, Judziewicz sight record; West Branch of Saxine Creek, Sec. 30, T51N R5W, ravine bottom with pole-sized yellow birch, the adjacent uplands cutover, 3 plants, 1 Aug. 1996, Judziewicz sight record; T51N R4W, deep ravine bottom with remnant 12–24″ hemlock, 8 mature unbrowsed plants, 10 July 1996, Judziewicz sight record; Eagle Bay brook hemlock-hardwoods, T52N R4W, ravine bottom, 88 plants, robust and with little evidence of deer browsing, perhaps the healthiest and most substantial population on the Wisconsin mainland, 3 July 1996, *J-11854*; Raspberry Point to Frog Bay ravines; T51N R3/4W, rich ravine bottoms in second growth sugar maple, hemlock, yellow and white birch, balsam fir, and red maple stands, 30 plants; 2–10 July 1996, Judziewicz sight records; Red

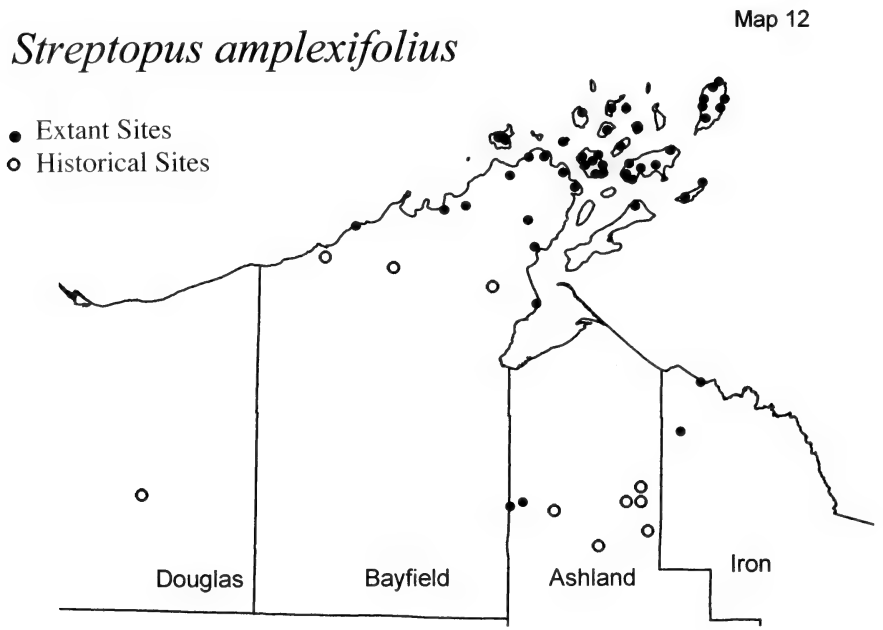
Cliff Point, T51N R3W, scattered and uncommon in small hardwood ravines and uplands near the lake, 5 July 1996, Judziewicz sight record; North Branch of Pikes Creek, Sec. 5, T50N R4W, 15 robust plants at base of steep slope on S bank of creek, with yew and under sugar maple, 1 July 1996, *J-11845*; Birch Run white cedar stand, just N of Bayfield Fish Hatchery, Sec. 21, T50N R4W, browsed white cedars next to cold brook, 3 plants, 20 June 1996, Judziewicz sight record; Houghton Falls, ravine just N of Washburn and W of railroad grade, Sec. 27, T49N R4W, sandstone gorge bottom shaded by hemlock and yellow birch, 7 plants, 9 Aug. 1996, Judziewicz sight record. DOUGLAS CO.: Solon Springs (T45N R12W), 1907, only 1 plant, *J. Davis s.n.* (MIL). IRON CO.: Rich boreal ravine bottom woods near mouth of Carpenter Creek just W of Saxon Harbor, Sec. 11, T47N R1W, a few plants, 24 May 1995, Judziewicz sight record; Vaughn Creek, Sec. 9, T46N R1W, rich wooded bottoms along creek, 28 May 1996, J. Nekola sight record; also at two sites near Saxon Harbor and the mouth of the Montreal River in the 1930s.

20. *Trisetum spicatum* (L.) K. Richter, spike trisetum (Grass family, Gramineae). Conservation status: Federal, none; Mich., special concern; Minn., no status; Wis., threatened. (Map 13)

This grass is found in northern Eurasia and North America, ranging south in the New World to Central America in the mountains. Spike trisetum is uncommon in the Great Lakes region, and in Wisconsin it occurs only in the Lake Superior region in Ashland and Bayfield Counties. Its principal habitat is north-, northeast-, or northwest-facing sandstone cliffs, where it grows in small, moist pockets of soil in fissures or on mossy, seeping or wave-splashed ledges, usually located from 1–5 meters above Lake Superior. Individuals grow singly or in lines up to 12 meters long in joints and fissures in the rock. Spike trisetum frequently grows in areas that are semi-shaded by cliff-top "krummholz" forest consisting of stunted trees of white cedar (*Thuja occidentalis*), yellow birch (*Betula alleghaniensis*), white birch (*B. papyrifera*), white spruce (*Picea glauca*), showy mountain-ash (*Sorbus decora*), and balsam poplar (*Populus balsamifera*), as well as the shrubs red-osier dogwood (*Cornus stolonifera*) and green alder (*Alnus viridis* subsp. *crispa*). Herbaceous associates are infrequent but may include *Poa nemoralis*, *Stellaria borealis*, *Agrostis scabra*, and, on Ironwood, Otter, and Outer Islands, *Pinguicula vulgaris*. At its stations on Madeline Island and on the mainland at Raspberry Point, other associates include *Primula mistassinica*, *Potentilla tridentata*, and *Senecio pauperculus*.

Surveys from 1991–1996 turned up numerous new sites for this grass on the Bayfield Peninsula and on the Apostle Islands (Judziewicz 1993, 1996, 1997). Most populations are small with only a few individuals, suggesting that populations are dynamic with establishment due to long-distance dispersal of seeds by lake currents, and frequent local extinctions.

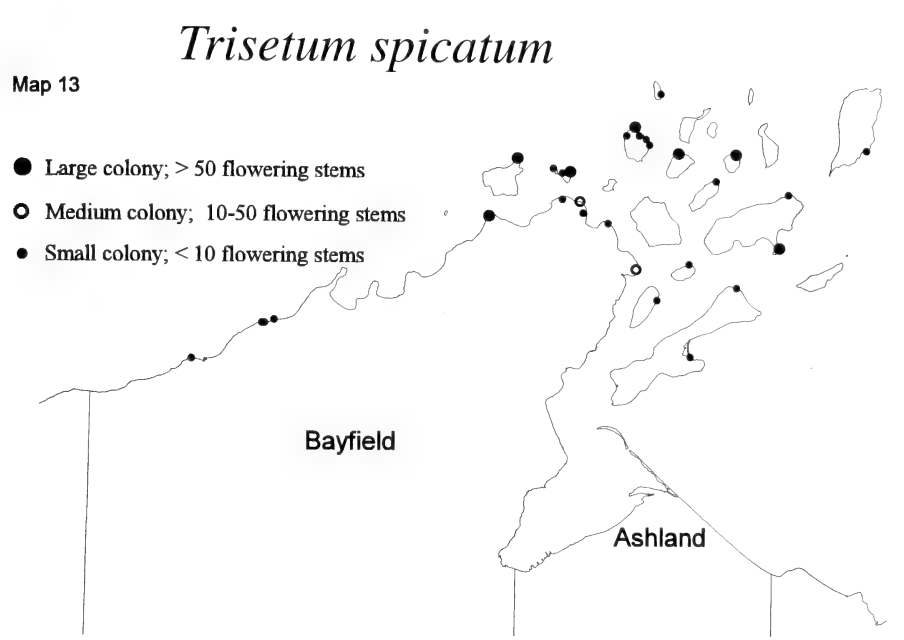
WISCONSIN. ASHLAND: Apostle Islands: Bear, Otter, Manitou, Ironwood, Stockton, Hermit, Basswood, and Outer Islands (see Judziewicz 1993 and Judziewicz & Koch 1993); Madeline Island, south shore of Big Bay, sandstone cliffs, 10 Aug. 1973, *Tans 166* (MIL); also at Steamboat Point at the north tip of the island (Tans); both sites not relocated, 1990–1996 by Judziewicz; Devils Island, rare on wave-splashed sandstone ledges on SE side of island, 22 June 1996, *J-11800*; Outer Island, rare on wave-splashed sandstone ledge with abundant *Pinguicula vulgaris* on SE side of island, 15 July 1996, *J-11933*. BAYFIELD: Port Wing to Orienta, 14 July 1897, *Cheney 7333* (MIL) [the only suitable habitat here would be the sandstone ledges and low cliffs on Quarry Point just west of Port Wing; these were thor-



oughly searched on foot and by canoe several times during 1995, with no success in finding *Trisetum* or other rare plants]; Near Herbster to Port Wing, 8 July 1897, *Cheney 6971* (WIS); relocated on sandstone cliffs and ledges at three sites west of Herbster on 22 Aug. 1995: Sec. 6–7, T50N R7W, 8 clumps, *J-11603*; Sec. 12, T50N R8W, 20 clumps, *J-11604*; Raspberry Point cliffs, T52N R4W, 31 July 1974, *Tans & Read 900* (MIL), relocated on 10 July 1996 by Judziewicz; Apostle Islands: Sand and York Islands (see Judziewicz 1993 and 1996, also Judziewicz & Koch 1993); Sand Point cliffs, Sec. 34, T52N R5W, 75 fruiting stems, 25 July 1995, *J-11475*; Allen Road cliffs, T52N R4W, 3 clumps, 22 Aug. 1996, *J-11606*; Point Detour cliffs, T52N R4W, 4 plants, 11 July 1996, *J-11870*; Eagle Bay cliffs, T52N R4W, 10 plants, 3 July 1996, *J-11855*; Red Cliff Point cliffs, T51N R3W, E-facing sandstone wave-splashed ledges with *Euthamia graminifolia*, *Epilobium angustifolium*, *Hieracium florentinum*, and *Polypodium virginianum*, 5 July 1996, *J-11884*.

21. *Vaccinium vitis-idaea* L. var. *minus* Lodd., mountain-cranberry or lingonberry (Heath family, Ericaceae). Conservation status: Federal, none; Mich., endangered; Minn., no status; Wis., endangered. (Map 14)

This inconspicuous (except in fruit) trailing shrub grows in northern Eurasia and northern North America south to Minnesota, Wisconsin, Michigan, and northern New England, and was long considered extirpated in both Wisconsin and Michigan. In Wisconsin, it was re-discovered in June 1994 by Kristin Westad, Mark Jaunzems, Gary Fewless and Steve Janke after a 64 year "hiatus", while Judziewicz re-discovered it in Michigan the same month after a 126 year gap (Judziewicz 1995, Voss 1996). Now it is known in Wisconsin from five sites, where it is rare on sandstone lakeshore cliffs in Bayfield County, and in mature black spruce swamp in inland Ashland and Forest Counties. North of



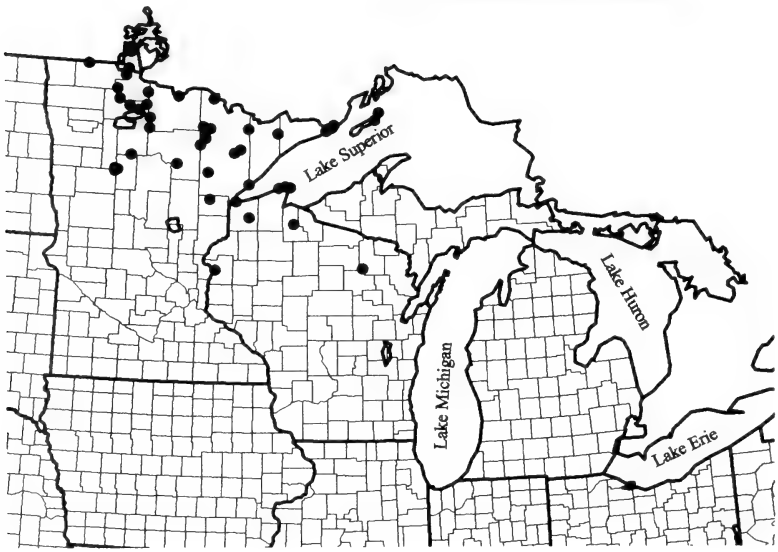
Lake Superior, mountain-cranberry often grows in burnt muskegs, and fire may be an important component in maintaining viable populations (Hall & Shay 1981).

Mountain-cranberry could easily be overlooked. At a distance its trailing stems and glossy, sometimes reddened leaves resembled a patch of unusually small bearberry (*Arctostaphylos uva-ursi*). Bearberry, however, besides its generally larger stature and shreddy reddish-brown bark, has larger, flatter, more obovate or paddled-shaped leaves. Mountain-cranberry has elliptical leaves with a distinctive crease along the midrib on the upper (adaxial) surface, and at least a few tiny black dots on the lower surface. In flower, it is easily recognized by its 4-merous flowers, campanulate rather than urceolate corolla, and bright red globular fruit. Despite the common name the flowers are not at all "shooting-starlike" as in the common cranberries *Vaccinium oxycoccos* and *V. macrocarpon*. Common understory associates at the Michigan and Wisconsin sites are *Cornus canadensis*, *Maianthemum canadense*, *Ledum groenlandicum*, *Gaultheria hispidula*, and the blueberries *Vaccinium angustifolium* and/or *V. myrtilloides*, plus those species listed under each site below. The Wisconsin cliff edge sites are always associated with deep mats of the moss *Hylocomium splendens*, and grow under green alder (*Alnus viridis* subsp. *crispa*), showy mountain-ash (*Sorbus decora*), and white birch (*Betula papyrifera*).

MICHIGAN. KEWEENAW CO.: Isle Royale, Smithwick Island, in 1868, *A.E. Foote s.n.* (MICH), site not relocated in searches by Edward G. Voss (17 July 1974), Janet (Gereau) Marr (12 July 1982) and Judziewicz (8 and 19 Aug. 1993); Isle Royale, Passage Island, rocky SE-facing shore ca. 1 km NE of lighthouse, shoreline basalt bedrock beach, 1,000-1,250 stems in mat of *Sphagnum compactum* DC. (*J-10933*, MICH) about 5–7 vertical

Map 14

Vaccinium vitis-idaea



meters above Lake Superior and 10–13 meters inland, partly shaded by sapling white cedar, and with scattered associates *Carex deflexa*, *Scirpus cespitosus*, *Potentilla tridentata*, and *Calamagrostis canadensis*, in fruit on 15 August 1994, *J-10932* (MICH). The colony was revisited on 4 June 1997, was healthy, and had expanded slightly in the intervening three years.

WISCONSIN. ASHLAND CO.: Conifer swamp W of Meder Lake, Sec. 19, T44N R2W, mature, dryish sphagnous black spruce/tamarack swamp, with *Vaccinium oxycoccos* and *V. myrtilloides*, locally common in understory with ca. 500 stems scattered in an area of 10 x 30 m in diameter, 14 June 1996, *N s.n.* (UWGB #24856), 16 June 1996, *J & N 11782* (WIS). BAYFIELD CO.: Apostle Islands National Lakeshore, Squaw Bay cliffs, Sec. 18, T51N R5W, second-growth boreal forest on edge of wet acid sandstone cliff of Lake Superior, 29 June 1995, ca. 2,000 stems, *J-11372*; Eagle Bay cliffs, T52N R4W, shaded cliff in dense moss mat under green alder and level bluff top edge forest in open 6–12″ white birch stand with small red maple and balsam-fir, common associates, 1 sq. m. of colony is on steep 45° N-facing bluff ca. 2 m below bluff edge, while the majority (75 sq. m) on level bluff top edge forest in fairly dense shade with a total of 5,000–10,000 stems, ca. 10% in old flower, 10 July 1996, *J-11393*; Raspberry Point cliffs, T52N R3/4W, moist shaded sandstone lake cliff in dense moss under canopy of scattered green alder, white spruce, and white birch, 1,000 stems (100 fertile) in area ca. 5 m in diameter, 10 July 1996, *J-11392*. DOUGLAS CO.: Superior, 64th Street and Hammond Avenue, intersection of Sec. 2, 3, 10, and 11, T49N R14W, 22 Apr. 1927, *L.R. Wilson 80* (WIS), not relocated during searches in 1979 (by W.S. Alverson) and 1995 (Judziewicz); Solon Springs, head of St. Croix Lake, Sec. 17, T45N R12W, 4 July 1930, *G.H. Conklin s.n.* (WIS). FOREST CO.: Forested area S of Crandon, Sec. 26, T35N R12E, lowland conifer swamp dominated by black spruce and balsam fir, June 1994, *Westad, Jaunzems, Fewless, and Janke s.n.* (WIS). POLK CO.: "Peatbogs," June 1887, ex Herb. J.H. Sandberg (MIN).

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THE BIG TREES OF MICHIGAN
18. Fraxinus americana L.
White Ash

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The largest known White Ash in Michigan is located south of Elk Rapids in Antrim County of Michigan's Lower Peninsula.

Description of the Species: The White Ash is a member of the Ash family (Oleaceae). The genus *Fraxinus* is the only tree form of the Ash family native to Michigan. The genera *Ligustrum, Syringa,* and *Forsythia*, the only other genera in this family in Michigan, are shrubs. Four members of the genus *Fraxinus* are found in Michigan. They all have pinnately compound, opposite leaves (Fig. 1). White Ash is distinguished by its short stalked lateral leaflets; essentially hairless twigs, petioles, and lower sides of leaves; twigs which are round in cross section; lower sides of leaflets conspicuously paler than the upper; and the epidermis of the twigs (except for the current shoot) which is usually flaking or peeling.

Location of Michigan's Big Tree: Michigan's State Champion White Ash is located about 1.6 mi. south of Elk Rapids in Antrim County, Michigan. To find the tree one may begin at Williamsburg and follow M72 to Elk Lake Rd. Take Elk Lake Rd. north 6.65 mi. to immediately beyond the Bokhara Kennels on the right. Turn right (north) on Hanel, a private blacktop road. Go about 1.3 mi. and follow the road left (north) when it turns. The tree is on the north side of a gray house at 11347 Hanel Rd. This location is in Sec. 28, T29N R9W.

Description of Michigan's Big Tree: The tree has a single healthy trunk. The circumference of the tree at breast height was measured on July 27, 1995 with Dr. John Spencer of Traverse City at 243″ (617 cm) [diameter = 77″ (195 cm)]. The crown spread was 100′ (30 m). The height was measured at 61′ (19 m). This is a newly found State Champion, and replaces the one found by Paul Thompson. The tree has a Michigan Botanical Club sign attached to the trunk.

INVITATION TO PARTICIPATE

If you would like to join us in extending this series of articles by visiting and describing one or more of Michigan's Big Trees, please contact Elwood B. Ehrle for help with locations, specifications for taking measurements, and assistance with the manuscript. The Michigan Botanical Club encourages your involvement in this activity. Please remember to ask permission before entering private property.

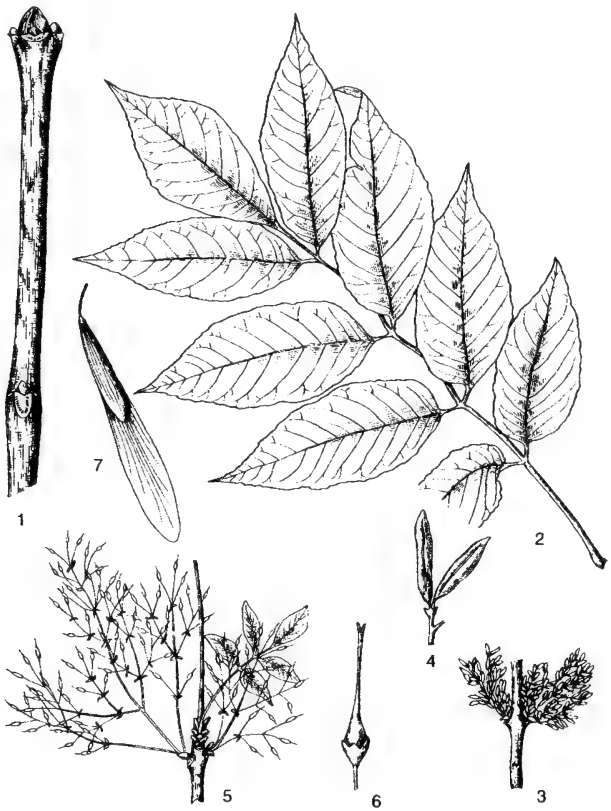

FIGURE 1. Characteristics of White Ash. Illustrations are from Barnes & Wagner (1991). 1. Winter twig, ×1; 2 Leaf, ×1/4; 3. Male flowering twig, ×1/2; 4. Male flower enlarged; 5. Female flowering shoot, ×1/2; 6 Female flower, enlarged; 7. Fruit, a samara, ×1.

DEDICATION

This series of articles is dedicated to the memory of Paul Thompson, Michigan's Big Tree Coordinator for over 40 years, who died in 1994.

LITERATURE CITED

Barnes, B. V., & W. H. Wagner, Jr. 1991. Michigan Trees. A Guide to the Trees of Michigan and The Great Lakes Region. Univ. of Michigan Press, Ann Arbor. viii + 383 pp.

THE BIG TREES OF MICHIGAN
19. Acer platanoides L.
Norway Maple

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The largest known Norway Maple in Michigan is located in the city of Empire in Leelanau County of Michigan's Lower Peninsula.

Description of the Species: The Norway Maple is a member of the maple family (Aceraceae). Seven species of maple are native to Michigan. Only one, *Acer negundo*, has pinnately compound leaves. All the others have simple, opposite, palmately lobed leaves. The Norway Maple is distinguished from the other simple-leaved species by having leaf sinuses which are rounded at the base, lower sides of leaves green and glabrous, petioles which release a milky sap when a leaf is removed from a twig, and samaras with wings diverging at nearly 180 degrees (See Fig. 1). The fruit is not persistent in winter. The Norway Maple is frequently planted as a street and park tree throughout the state. Although the map of its documented distribution (Fig. 1) shows relatively few locations where it is naturalized, it is probably present in every county of the state as a planted tree.

Location of Michigan's Big Tree: Michigan's State Champion Norway Maple is located in Leelanau County, Michigan. One may find the tree by taking M-22 into Empire, Michigan. Turn west on Front St., past Union St. The tree is 1 1/2 blocks west of M-22 in front of a tan house on the north side of Main St. N at #10168. This location is in Sec. 28, T28N R14W.

Description of Michigan's Big Tree: The tree has a solid, healthy trunk. The circumference of the tree at breast height was measured on July 27, 1995 with Dr. John Spencer of Traverse City at 173″ (439 cm) [diameter = 55″ (140 cm)]. The crown spread was 75′ (23 m), less than the 91′ (28m) previously recorded by Paul Thompson. The height was measured at 80′ (24 m), also less than the 105′ (32 m) recorded by Thompson. Although its crown size and height have decreased, its State Champion status remains secure because State Champion trees are determined by the circumference of the trunk at breast height alone.

INVITATION TO PARTICIPATE

If you would like to join us in extending this series of articles by visiting and describing one or more of Michigan's Big Trees, please contact Elwood

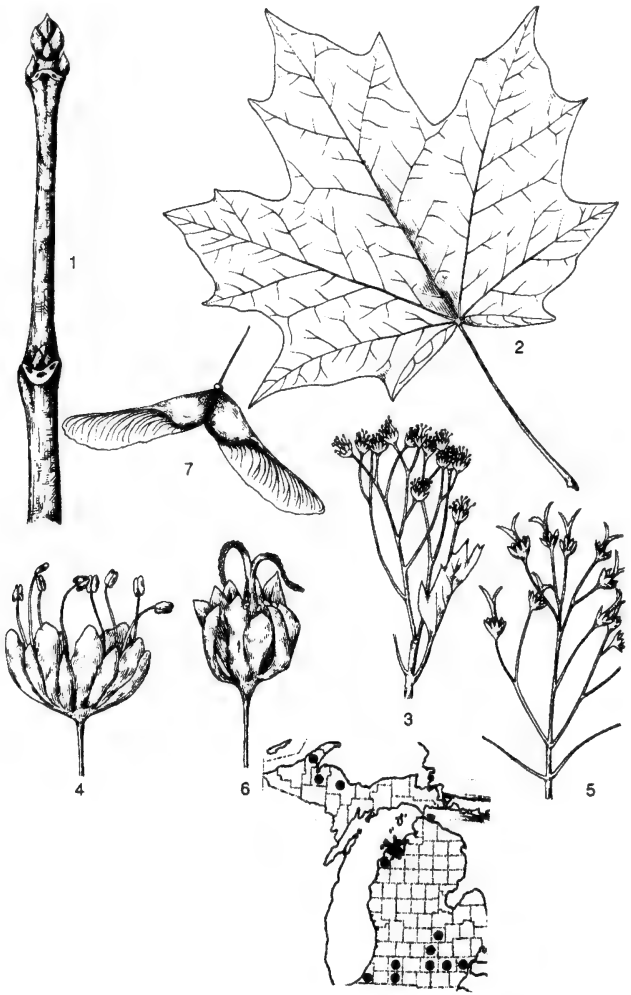

FIGURE 1. Documented distribution in Michigan and characterisics of the Norway Maple. Map is from Voss (1985). The star indicates the location of Michigan's Big Tree. Illustrations are from Barnes & Wagner (1991). 1. Winter twig, ×1; 2 Leaf, ×1/2; 3. Raceme of staminate flowers, ×1/2; 4. Male flower enlarged; 5. Raceme of female flowers, ×1/2; 6 Female flower, enlarged; 7. Fruit, samaras, ×1/2.

B. Ehrle for help with locations, specifications for taking measurements, and assistance with the manuscript. The Michigan Botanical Club encourages your involvement in this activity. Please remember to ask permission before entering private property.

DEDICATION

This series of articles is dedicated to the memory of Paul Thompson, Michigan's Big Tree Coordinator for over 40 years, who died in 1994.

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Voss, E. G. 1985. Michigan Flora. Part II. Dicots. (Saururaceae-Cornaceae). Bull. Cranbrook Inst. Sci. 59 and Univ. Michigan Herbarium. xix + 724 pp.

REVIEW

GLEASON'S PLANTS OF MICHIGAN, a field guide. Revised by Richard K. Rabeler. First edition, 1998. Paperback; 398 pages. Oakleaf Press, 920 Vesper Road, Ann Arbor, MI 48103. Telephone: 734. 668. 8579. ISBN 09663251-0-9. $21.95.

Henry Allan Gleason (1882–1975) is best known to most botanists as author of "New Britton & Brown Illustrated Flora," in 3 volumes, 1952. Arthur Cronquist (1919–1992) revised and condensed Gleason's 3 volumes into "Manual of Vascular Plants," 1963, edition 1, by Gleason & Cronquist, even though Gleason had no direct hand in it. Finally, long after Gleason's demise, Cronquist brought out (1991) "Manual of Vascular Plants, edition 2." Gleason's name was retained as an author because many of the words are still Gleason's and the posthumous co-authorship points to the historical antecedents of the book.

As we learn from the Preface, pp. 7–9, Gleason came to the University of Michigan in 1910, and the first edition of his "Plants of Michigan" appeared in 1918. This work went through three editions, though the later editions were little changed from the 1918 original.

Like Cronquist, Rabeler acknowledges his debt to Gleason in his title. Richard labels himself as "reviser," though in fact it is only Gleason's basic structure that is retained; essentially all the rest is pure Rabeler. Well, almost. Very sensibly, the author keys his book to the three volumes of Voss; the first volume came out in 1972, and may no longer reflect all the current opinion; to remedy that, alternative names adopted in the latest Gleason & Cronquist are given in brackets. For example, Quack Grass was given in Voss as *Agropyron repens*; Gleason & Cronquist ed. 2 have it as *Elytrigia repens*, we are told. That's helpful, but be aware that Mary Barkworth (Phytologia 83[4]: 302–311, received here 5 October 1998, but the issue dated October 1997) has concluded that Quack Grass is best treated as *Elymus repens*!

As is usual in field guides, and on Gleason's original pattern, the book includes only gymnosperms and angiosperms. Ferns and their allies are not included. Nor are bryophytes. Kingdom Plantae includes both groups, along with cycads, gymnosperms, and angiosperms. This contradictory use of the term "plants" (Plantae) doesn't seem to bother botanists. Never has.

There's an innovation Rabeler introduces that I had never seen before: he puts in little boxes, here and there, in a different type face and size, to inform the user— things like "*Arisaema* is the only Michigan monocot with compound leaves." I knew that, but only subconsciously. I am sure I never said it to a student.

I wondered how Richard would handle the problem of 170 species of *Carex* in the Michigan flora. The answer is, he puts in one of his little boxes, and explains that the key accounts for only 20 of the more common species. For the rest, resort to Voss (you can still get all three hardback volumes for only $48). The same common-sense approach is used for *Potamogeton*, where only two of the thirty Michigan species are included.

There's an ample bibliography, unusual in books of this sort. It is separated into two segments, "Books and articles cited in the text" and "Other books useful in identification of Michigan plants." Now is that common-sensical or what! The only thing lacking is the website addresses of dealers in new and used books; I'll bet Richard debated whether to include that.

One oddity that caught my attention as soon as I opened the book is the absence of authors for the binomials. Clearly, the author intends that you go to the more technical works, like Voss or Gleason & Cronquist, if you want those. He had to make compromises to keep the book to a size you can hold in your hand, and to keep the book affordable.

Illustrations: 45 in all, far too few, but see above. Those that are present are simply extraordinary. They are accurate to a fault, carefully crafted to allow for reduction to the printed page, mostly full-page, and properly sited adjacent to where the species comes out in the key (but not referred to at that point). The Caryophyllaceae got two illustrations, reflecting the author's pardonable bias. (His educational background and research interests are given too briefly on cover four; his date of birth, 1953, is not.) Elise C. Bush is credited on the title page as the artist. It is most fitting that she should receive such recognition.

As a former editor of this journal, Rabeler is well aware that no one can be his own editor. Vivienne N. Armentrout is properly and prominently credited on the title page as editor. She must have

played a large role in the production of this book, given that it is utterly free of typos and impeccably grammatical. I mean to say, Rich is good, I'll give him that, but she surely found and corrected the slips that even Rich would not have detected.

I visualize that this book is going to be for sale at the headquarters buildings in state parks and nature preserves, as well as in college bookstores. Because of its wide and diverse audience, Rich has very helpfully included a brief section (p. 21) on "Botany in Michigan," with full information about the places where one can study Botany and about the Michigan Botanical Club.

So what did he leave out? Abbreviations! The only ones he permitted himself were things like LP for "Lower Peninsula," or SLP for "Southern Lower Peninsula," and even these are explained on p. 18.

Common names: a goodly number are given, taken from Voss or from Gleason's original book, but many species have none. In the Introduction, p. 15, there are ample warnings about how misleading and confusing common names can be. Rabeler avoids providing common names by translating the Latin; I have seen this done and it is irritating and pointless. The ornithologists have this business of providing common names regularized and orderly; I see no prospect it will ever occur in Botany.

First Gleason, then Voss, now Gleason again in Rabelerian guise: Michigan should be proud.

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Rich fen beach pools at Evergreen Beach, Presque Isle County, Michigan. Photograph by Sandra Planisek.

The Michigan Botanist is still in need of good photographs for the cover of the journal. Black-and-white prints are preferred; we have accepted color photographs in the past, but have had difficulties in reproducing them satisfactorily. We can also use line drawings (see the cover of Vol. 34, No. 3, May 1995). They can be pictures of individual species (like this month's cover), groups of species, or habitats (like the photo above), and may include people, if appropriate. The pictures must be horizontal ("landscape") in orientation (unlike the "portrait" or vertical photo above). They should be sent to the Editor, The Michigan Botanist, c/o University of Michigan Herbarium, North University Building, Ann Arbor, MI 48109-1057 (the full 9-digit ZIP code is essential).

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On the cover: *Tawny cotton-grass* (Eriophorum virginicum *L.*), *Stutsmanville Bog, Emmet Co., Michigan. Photographer unknown.*